

**TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371**

KCC-13368.10

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5)

09/402059

INTERNATIONAL APPLICATION NO.

PCT/EP98/01684

INTERNATIONAL FILING DATE

23 March 1998

PRIORITY DATE CLAIMED

27 March 1997

TITLE OF INVENTION

ABSORBENT ARTICLE

APPLICANT(S) FOR DO/EO/US


Maria RAIDEL et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND OR SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (unexecuted, attached to a copy of the International Application)
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).
11. to 16. below concern other document(s) or information included:
  11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
  12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
  13. ☒ A FIRST preliminary amendment.  
☐ A SECOND or SUBSEQUENT preliminary amendment.
  14. ☐ A substitute specification. (attached to a red-ink marked-up version of the English language translation)
  15. ☐ A change of power of attorney and/or address letter.
  16. ☒ Other items or information:
    - Form PCT/ISA/210 (English language version, 4 pages)
    - Certificate of Mailing by Express Mail (2 pages)
    - Return Receipt Postcard

EXPRESS MAIL NO.: EL456498477US

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U.S. APPLICATION NO. (if known, see 37 CFR 1.5) <b>69/402059</b>		INTERNATIONAL APPLICATION NO. PCT/EP98/01684		ATTORNEY'S DOCKET NUMBER KCC-13368.10		
<b>1. The following fees are submitted:</b> <b>BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):</b> Search Report has been prepared by the EPO or JPO ..... \$ 840.00  International preliminary examination fee paid to USPTO (37 CFR 1.482) ..... \$ 670.00  No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) ..... \$ 760.00  Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$ 970.00  International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) ..... \$ 96.00				CALCULATIONS		PTO USE ONLY
<b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				\$ 840.00		
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).						
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE			
Total claims	67* - 20 =	47*	X \$18.00	\$ 846.00		
Independent claims	3* - 03 =	0*	X \$78.00	\$ 0.00		
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$260.00			
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$ 1,686.00		
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).						
<b>SUBTOTAL =</b>				\$ 1,686.00		
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				+		
<b>TOTAL NATIONAL FEE =</b>				\$ 1,686.00		
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+		
<b>TOTAL FEES ENCLOSED =</b>				\$ 1,686.00		
* Based upon entry of the First Preliminary Amendment.				Amount to be: refunded	\$	
				charged	\$	
a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>1,686.00</u> to cover the above fee is enclosed.  b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.  c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>19-3550</u> . A duplicate copy of this sheet is enclosed.						
<b>NOTE:</b> Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.						
SEND ALL CORRESPONDENCE TO:  Pauley Petersen Kinne & Fejer 2800 West Higgins Road, Suite 365 Hoffman Estates, Illinois 60195 (847) 490-1400 Fax: (847) 490-1403				 SIGNATURE  Maxwell J. Petersen  NAME  32,772  REGISTRATION NUMBER		

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420 Rec'd PCT/PTO 27 SEP 1999

Docket No.: KCC-13368.10

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Maria RAIDEL  
Franz ASCHENBRENNER

Title: ABSORBENT ARTICLE

Based Upon: PCT/EP98/01684

Express Mail No.: EL456498477US

Date of Deposit: 27 September 1999

**FIRST PRELIMINARY AMENDMENT**

**Box PCT**  
Assistant Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

Please enter the following preliminary amendment to the above-identified patent application.

In the Specification:

Page 1, line 7, delete "Description" and insert --FIELD OF THE INVENTION--;

line 9, insert --BACKGROUND OF THE INVENTION--;

line 15, after "they" delete "comprise" and insert --include--;

line 17, before "article" delete "said";

line 18, before "article" delete "said"; and

line 19, after "use;" delete "as well as" and insert --and--.

Page 2, line 11, before "leads" delete "liquid; this" and insert --liquid. This--;

delete text beginning at Page 2, line 27 and ending at Page 2, line 33; and

line 34, insert --SUMMARY OF THE INVENTION--.

Page 3, line 3, before "absorbent" delete "said"; and

line 18, after "layer" delete "comprises" and insert --includes--.

Page 4, line 10, after "body" delete "comprising" and insert --including--;

line 13, before "layer" delete "said"; and

line 30, before "a" delete "comprise" and insert --include--.

Page 7, line 14, after "can" delete "however"; and

line 36, after "also" delete "comprise" and insert --include--.

Page 8, line 12, before "microcapsules" delete "said".

Page 17, line 19, after "can" delete "comprise" and insert --include--.

Page 18, line 13, after "can" delete "comprise" and insert --include;

line 17, after "chamber" delete "comprises" and insert --includes--; and

line 24, after “body” delete “comprising” and insert

--including--.

Page 20, line 18, after “it” delete “comprises” and insert --includes--;

line 22, before “a” delete “comprises” and insert --includes--;

line 29, after “can” delete “comprise” and insert --include--;

and

line 36, before “a” delete “comprising” and insert

--including--.

Page 21, line 1, after “also” delete “comprise” and insert --include--;

line 4, before “an” delete “comprises” and insert --includes--;

line 6, after “can” delete “comprise” and insert --include--;

line 16, after “layer” delete “comprising” and insert

--including--;

line 31, after “can” delete “comprise” and insert --include--;

and

line 34, after “can” delete “comprise” and insert --include--.

Page 22, line 3, before “a” delete “comprise” and insert --include--;

line 14, before “at” delete “comprise and insert --include--;

line 16, after “also” delete “comprise” and insert --include--;

and

line 17, insert --BRIEF DESCRIPTION OF THE DRAWINGS--.

Page 25, line 28, insert --DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS--; and

line 36, before “a frontal” delete “comprising” and insert --including--.

Page 26, line 25, after “core” delete “comprises” and insert --includes--.

Page 27, line 3, before “tied-in” delete “comprises” and insert --includes--.

Page 28, line 4, after “The” delete “said”;

line 11, after “is” delete “consists” and insert --made--;

line 13, before “the” delete “consists of” and insert --includes--; and

line 14, before “tied-in” delete “said” and after “areas” insert --48--.

Page 29, line 20, after “also” delete “comprise” and insert --include--.

In the Drawings:

Please delete the drawing having no number, which is entitled “Figure for publication with the Abstract.”

In the Claims:

Please cancel Claims 1-44, and add the following new Claims 45-111.

45. An absorbent article, comprising:

a liquid-permeable layer;

a substantially liquid-impermeable layer; and

an absorbent body between the liquid-permeable layer and the substantially liquid-impermeable layer;

the absorbent body comprising a flowable absorbent material which remains able to flow after contact with a liquid.

46. The absorbent article of Claim 45, wherein the flowable absorbent material comprises absorbent particles.

47. The absorbent article of Claim 46, wherein the absorbent particles comprise spherical particles.

48. The absorbent article of Claim 46, wherein the absorbent particles have a diameter of about 100-2000 microns.

49. The absorbent article of Claim 46, wherein the absorbent particles have a diameter of about 200-800 microns.

50. The absorbent article of Claim 45, wherein the flowable absorbent material comprises polymethylene area.

51. The absorbent article of Claim 50, wherein the polymethylene urea constitutes at least about one third by weight of the flowable absorbent material.

52. The absorbent article of Claim 50, wherein the polymethylene urea constitutes at least about one half by weight of the flowable absorbent material.

53. The absorbent article of Claim 50, wherein the polymethylene urea constitutes at least about two thirds by weight of the flowable absorbent material.

54. The absorbent article of Claim 50, wherein the polymethylene urea constitutes at least about 80% by weight of the flowable absorbent material.

55. The absorbent article of Claim 50, wherein the flowable absorbent material consists essentially of the polymethylene urea.



56. The absorbent article of Claim 50, wherein the polymethylene urea is substantially free of ether groups and formaldehyde.

57. The absorbent article of Claim 45, wherein the flowable absorbent material comprises a superabsorbent material.

58. The absorbent article of Claim 57, wherein the superabsorbent material comprises a polyacrylate.

59. The absorbent article of Claim 45, wherein the absorbent body further comprises a fibrous matrix, and the flowable absorbent material is disposed within the matrix.

60. The absorbent article of Claim 45, wherein the absorbent body further comprises at least one care substance.

61. The absorbent article of Claim 60, wherein the care substance comprises a material selected from extracts of aloe vera, marigold, chamomile, and combinations thereof.

62. The absorbent article, comprising:

- a substantially liquid-impermeable layer;
- an absorbent body connected to the substantially liquid-impermeable layer in a central region of the substantially liquid-impermeable layer; and
- a liquid permeable layer over a side of the absorbent body opposite the substantially liquid-impermeable layer;

the absorbent body comprising a flowable absorbent material which remains able to flow after contact with a liquid.

63. The absorbent article of Claim 62, wherein the absorbent body and substantially liquid-impermeable layer are connected using an adhesive.

64. The absorbent article of Claim 62, wherein the absorbent body and substantially liquid-impermeable layer are connected using one or more seams.

65. The absorbent article of Claim 62, wherein the absorbent body further comprises a secondary storage layer including a soft absorbent material.

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66. The absorbent article of Claim 65, wherein the soft absorbent material comprises a material selected from coform materials, airlaid materials, tissue cotton-wools, and combinations thereof.

67. The absorbent article of Claim 65, wherein the soft absorbent material comprises a nonwoven material selected from spunbond fabrics, carded webs, and combinations thereof.

68. The absorbent article of Claim 62, wherein the absorbent body further comprises a fibrous matrix, and the flowable absorbent material is disposed within the matrix.

69. The absorbent article of Claim 68, wherein the flowable absorbent material is disposed substantially homogeneously within the matrix.

70. The absorbent article of Claim 62, wherein the absorbent body further comprises two or more layers of a fibrous material, and the flowable absorbent material is disposed between the layers of fibrous material.

71. The absorbent article of Claim 68, wherein the fibrous matrix comprises a material selected from cellulose, a cellulose/polypropylene mixture, a coform material, and combinations thereof.

72. The absorbent article of Claim 70, wherein the two or more layers of fibrous material comprise a material selected from cellulose, a cellulose/polypropylene mixture, a coform material, and combinations thereof.

73. The absorbent article of Claim 68, wherein the absorbent body comprises the fibrous material and flowable absorbent material in a weight ratio of about 99-75% fibrous material to about 1-25% flowable absorbent material.

74. The absorbent article of Claim 73, wherein the weight ratio is about 95-80% fibrous material to about 5-20% flowable absorbent material.

75. The absorbent article of Claim 73, wherein the weight ratio is about 90-85% fibrous material to about 10-15% flowable absorbent material.

76. The absorbent article of Claim 62, wherein the absorbent body further comprises at least one care substance.

77. The absorbent article of Claim 76, wherein the care substance comprises a material selected from extracts of aloe vera, marigold, chamomile, and combinations thereof.

78. The absorbent article of Claim 76, wherein the care substance is enclosed in microcapsules.

79. The absorbent article of Claim 78, wherein the care substance is releaseable from the microcapsules in response to heat or pressure.

80. The absorbent article of Claim 62, wherein the flowable absorbent material is treated with a substance selected from bactericidal, fungicidal and viricidal substances, and combinations thereof.

81. The absorbent article of Claim 80, wherein the substance comprises a bactericidal substance selected from chlorinated levulinic acid, alkyldimethylbenzylammonium halogenides, and combinations thereof.

82. The absorbent article of Claim 62, wherein the flowable absorbent material remains flowable after absorbing at least 10 ml liquid per gram of flowable absorbent material.

83. The absorbent article of Claim 62, wherein the flowable absorbent material comprises absorbent particles.

84. The absorbent article of Claim 83, wherein the absorbent particles comprise spherical particles.

85. The absorbent article of Claim 83, wherein the spherical particles have a diameter of about 100-2000 microns.

86. The absorbent article of Claim 83, wherein the spherical particles have a diameter of about 200-800 microns.

87. The absorbent article of Claim 62, wherein the flowable absorbent material comprises polymethylene urea.

88. The absorbent article of Claim 87, wherein the polymethylene urea constitutes at least one third of the flowable absorbent material.

89. The absorbent article of Claim 87, wherein the polymethylene urea constitutes at least one half of the flowable absorbent material.

90. The absorbent article of Claim 87, wherein the polymethylene urea constitutes at least two thirds of the flowable absorbent material.

91. The absorbent article of Claim 87, wherein the polymethylene urea constitutes at least 80% of the flowable absorbent material.

92. The absorbent article of Claim 87, wherein the flowable absorbent material consists essentially of the polymethylene urea.

93. The absorbent article of Claim 87, wherein the polymethylene urea is substantially free of ether groups and formaldehyde.

94. The absorbent article of Claim 62, wherein the flowable absorbent material comprises a superabsorbent material.

95. The absorbent article of Claim 94, wherein the superabsorbent material comprises a polyacrylate.

96. The absorbent article of Claim 62 having a length and a width, wherein the absorbent body comprises at least one core which contains the flowable absorbent material, the core having a length that is less than or equal to the length of the absorbent article, and a width that is less than or equal to the width of the absorbent article.

97. The absorbent article of Claim 62, wherein the absorbent body comprises at least two chambers, and at least one wall between the chambers.

98. The absorbent article of Claim 97, wherein the wall is aligned in a longitudinal direction of the absorbent article.

99. The absorbent article of Claim 97, wherein the wall is aligned in a transverse direction of the absorbent article.



100. The absorbent article of Claim 97, comprising at least one wall aligned in a longitudinal direction of the absorbent article and at least one wall aligned in a transverse direction of the absorbent article.

101. The absorbent article of Claim 96, wherein the core comprises a plurality of chambers.

102. A hygiene article, comprising:  
a liquid-permeable layer;  
a substantially liquid-impermeable layer; and  
an absorbent body between the liquid-permeable layer and the substantially liquid-impermeable layer;  
the absorbent body comprising a flowable absorbent material which remains able to flow after contact with a liquid.

103. The hygiene article of Claim 102, comprising a feminine hygiene article.

104. The hygiene article of Claim 102, comprising a sanitary napkin.

105. The hygiene article of Claim 102, comprising a panty liner.

106. The hygiene article of Claim 102, wherein the liquid-permeable layer comprises a central aperture.

107. The absorbent article of Claim 1, comprising a diaper.

108. The absorbent article of Claim 1, comprising an incontinence pad.

109. The absorbent article of Claim 62, comprising a feminine hygiene article.

110. The absorbent article of Claim 62, comprising a diaper.

111. The absorbent article of Claim 62, comprising an incontinence pad.

Based Upon: PCT/EP98/01684

Docket No.: KCC-13368.10

### REMARKS

The specification has been amended to correct various informalities.

The claims have been rewritten in U.S. format. No new matter has been added.

Respectfully submitted,



Maxwell J. Petersen  
Regis. No. 32,772

Pauley Petersen Kinne & Fejer  
2800 West Higgins Road  
Suite 365  
Hoffman Estates, Illinois 60195  
(847) 490-1400  
FAX (847) 490-1403

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Absorbent ArticleDescription

The present invention relates to absorbent articles.

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Disposable absorbent articles have been known for many years. They are used for example as sanitary napkins for feminine hygiene, panty liners, children's nappies/diapers or incontinence pads. These disposable absorbent articles share the characteristics that they comprise a liquid-permeable layer which is disposed towards the wearer's body when the said article is in use; a liquid-impermeable layer which is disposed away from the wearer's body when the said article is in use; as well as a liquid-storing layer arranged between these two layers. The liquid-storing layer can for example be made from defiberised cellulose.

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The limited liquid-absorption capacity of pure cellulose layers as a liquid-storing material has been a disadvantage with the known disposable absorbent articles. Furthermore, the retention capacity of cellulose, after having been in contact with liquid, is not very pronounced. Finally, deformed cellulose material maintains the shape it has assumed, a fact which is often considered disagreeable by the wearer of the absorbent article. The term 'wearer' as used hereinafter can both be male and female.

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In addition, disposable absorbent articles are known whose liquid-storing layer contains superabsorbent materials. Superabsorbent materials are able to absorb many times their dry weight of liquid, which they are able to retain to some

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27 SEPTEMBER 1999

One difficulty when using superabsorbent materials in the liquid-storing layer of absorbent articles is that superabsorbent materials experience a volume increase when they are in contact with a liquid, i.e. they swell. This leads to the fact that the absorbent article causes a volume increase and to reduced wearer comfort. Furthermore, the individual components of the superabsorbent materials have a tendency to conglutinate after absorbing a liquid; this leads to a pronounced reduction in the theoretically possible liquid-absorption capacity (so-called gel blocking). Gel blocking results in limited distribution of the liquid which has entered the absorbent article. In the case of contact with a substantial amount of liquid, this might lead to the absorbent article no longer being able to completely absorb the liquid in spite of the theoretical storage capacity still being adequate. This leads to the wearer of the article experiencing a feeling of wetness of the skin and thus discomfort and it also leads to the risk of the wearer's garments becoming soiled. Finally, the absorbent article can also experience permanent deformation as a result of the gel blocking effect, thus further reducing wearer comfort of the article.

It is thus the object of the present invention to describe absorbent articles without the above-mentioned disadvantages of known products. This object is met according to the invention by the absorbent article described in the independent claims 1 and 2. Further advantageous embodiments, details and aspects of the present invention are contained in the dependent claims, the description and drawings.

35 The present invention relates to an absorbent article comprising a liquid-permeable layer disposed towards the

wearer's body and a liquid-impermeable layer disposed away from the wearer's body. An absorbent body is arranged between these two layers, the said absorbent body absorbing the liquid which has entered the absorbent article through the liquid-permeable layer. The absorbent body of the absorbent article according to the invention is characterized in that it contains an absorbent material which remains able to flow even after having been in contact with a liquid. On the one hand, this novel design results in optimal adaptation of the absorbent article to the wearer's individual body contours, leading to a considerable increase in wearer comfort. On the other hand, the solution according to the invention also results in the article maintaining its functionality even in a deformed condition.

A special embodiment of the absorbent article according to the first aspect is an embodiment in which the liquid-permeable upper cover layer comprises folds aligned in longitudinal direction. These folds are configured in such a way that the liquid-permeable layer partly covers the absorbent body also on the side disposed away from the body when the article is worn. On the one hand this is attained by the absorbent body not being connected to the underlying layer along its entire "underside", but only in a small, central area. On the other hand two folds are made into the liquid-permeable layer, which, in longitudinal direction of the absorbent article, also partly encompass the absorbent body on the underside. This embodiment results in the absorbent body remaining flexible in spite of being embedded between the liquid-impermeable backing and the liquid-permeable cover layer, and fitting very well to the anatomical contours of the wearer.

If the liquid-permeable and the liquid-impermeable layers in their marginal areas are interconnected in such a way that a tightly sealed interior space is created, then the absorbent

body can be made from a loose, shifting material which remains able to flow even after having been in contact with a liquid, whereby the material can freely move within the entire interior space.

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According to a further aspect, the invention concerns an absorbent article with a liquid-impermeable layer which, when the article is used, is disposed away from the body and an absorbent body which is surrounded by a liquid-permeable  
10 outer cover, said absorbent body comprising an absorbent material which remains able to flow even after contact with a liquid, with the absorbent body being connected to the liquid-impermeable layer in a central area of the said layer. In this, it is not necessary for the absorbent body and the  
15 liquid-impermeable layer to be in direct contact with each other. If on top of the liquid-impermeable layer, one or several other layers are arranged in addition, the absorbent body is attached to the upper side of the uppermost layer.

20 A further aspect of the invention concerns an absorbent article whose absorbent body is made from an absorbent material, namely polymethylene urea. The absorbent article can comprise a liquid-permeable layer which, when the article is used, is disposed towards the body as well as a liquid-  
25 impermeable layer which, when the article is used, is disposed away from the body, with the absorbent body arranged between the liquid-permeable and the liquid-impermeable layer. However, alternative embodiments are also imaginable which, corresponding to the aspect described above, do not  
30 comprise a liquid-permeable upper cover layer but instead merely embed the polymethylene urea material in a liquid-permeable outer cover.

35 The new concept deviates from known designs in that a part, preferably the main part, of the absorbent components has a grainy consistency, if possible made from spherically-shaped

materials. The composition of the material of the absorbent body is such that during wear as well as during contact with a liquid, the absorbent material maintains its ability to flow even after contact with a liquid. Preferably, the absorbent material maintains its ability to flow up to a liquid-absorption of at least 10 ml/g of material. This allows optimal adaptation (ability to follow the wearer's body contours) to the respective body shape of the wearer, during various movements and types of load. In other words, the absorbent body "flows"; during lateral load or lateral pressure by the thighs it can avoid this load or pressure somewhat because material of the absorbent body is shifted or displaced to areas experiencing less load. When the load or the pressure ceases, displaced particles can flow back to the initial position where they are again available for absorbing liquid. On the other hand, as a result of these movements, particles can also be repositioned, and thus absorptive capacity and storage capacity can be used which so far has remained unused. References to "absorbent body" in the present case thus also cover the notion of "storage body".

The absorbent body, which at the same time serves as a storage layer and which contains an absorbent material that remains able to flow even after contact with a liquid, provides the following advantageous characteristics to the absorbent article according to the invention:

- Fast liquid-absorption (good penetration into the material able to flow, and good wetting of the material);
- Good liquid-retention (locking in the liquid even under pressure load);
- Good absorption performance (absorption practically without any increase in volume);
- No lumping after contact with liquid;
- Best possible adaptation to the wearer's individual body contours;



- Article is very soft, combined with high wearer comfort;
- Very good liquid-transport and good liquid-distribution;
- No collapsing or soaking as happens with cellulose absorbent bodies.

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Especially in the case of the absorbent article according to the invention, according to the above-mentioned further aspect, there is optimal adaptation to the anatomical contours of the wearer when the article is worn, because the covered absorbent body is practically "free", i.e. it is not separated from the body of the wearer by a liquid-permeable layer covering the entire article. The liquid emanating from the wearer's body can be absorbed by the absorbent body directly at the place of issue and can then be transferred from there or stored.

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Connection between the liquid-impermeable backing and the absorbent body covered by a liquid-permeable layer can take place in any suitable way. For example a connection made by adhesive means has been proven favourable in the mechanical manufacturing of the article according to the invention. However, the backing and absorbent body can for example also be firmly connected to each other by sewing, but of course care must be taken that the liquid-impermeable backing is not damaged in such a way that liquid can penetrate it.

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In addition it has been proven advantageous if the absorbent articles according to the invention on the side disposed towards the wearer's body, of the liquid-impermeable layer, comprise a further layer of soft material which serves as secondary storage. This further layer additionally increases the wearer comfort of the absorbent article. In addition, this further layer can also store liquid not yet absorbed by the main absorbent body, whereby of course the absolute storage capacity of the further layer is very much smaller in comparison to the actual absorbent body. Materials suitable

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for the further layer include coform (polypropylene-cellulose mixtures), airlaid (artificial fibres-cellulose mixtures) and non-woven materials, for example spin-bonded fabrics or card webs.

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According to a further aspect of the present invention the absorbent material which remains able to flow even after contact with a liquid can be embedded in a matrix made of fibrous material. In this, the material can be mixed into the fibre matrix in a homogenous way so that the components of the material which remains able to flow even after contact with a liquid are evenly distributed across the fibre structure and are embedded in the said structure. As an alternative to this, the absorbent body can however also be of layered construction whereby the absorbent material which remains able to flow even after contact with a liquid is embedded sandwich-like, between two or several layers of fibrous material. Finally, in the last-described sandwich structure in addition, absorbent material can be embedded which absorbent material remains able to flow even after contact with a liquid. Cellulose or a mixture of cellulose and polypropylene, i.e. a so-called coform material, are materials which as fibrous materials are particularly suitable for the above-mentioned purposes. The use of fibrous material leads to a still more optimal distribution of liquid in the absorbent article according to the invention because the fibres have a particular absorbency and can transport liquid in a directional way. The ratio of absorbent material which remains able to flow even after contact with a liquid, to fibrous material, is preferably 1 to 25% by weight to 99 to 75% by weight and in particular 10 to 15% by weight to 90 to 85% by weight.

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According to a further aspect of the invention, the absorbent body, apart from the absorbent material which remains able to flow even after contact with a liquid, can also comprise at

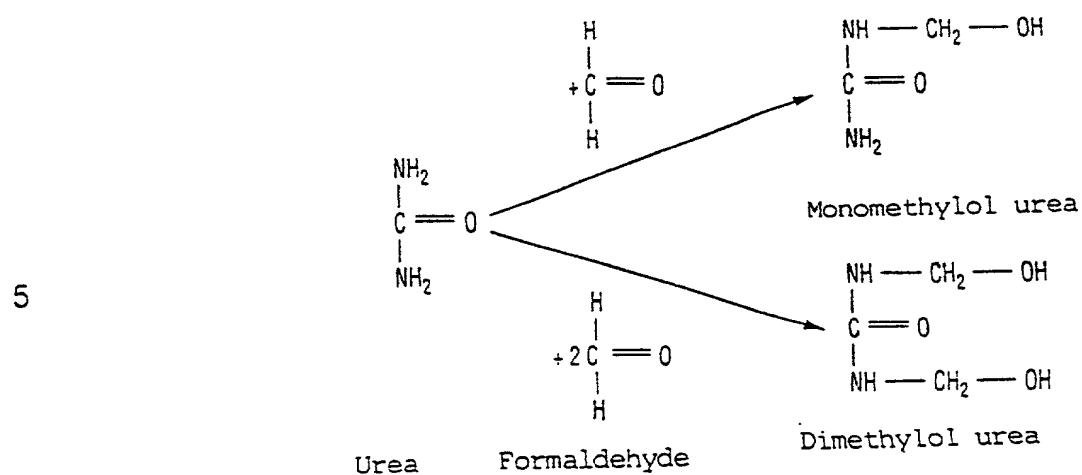
least one care substance, adsorptively bound. Primarily this refers to substances which protect the skin of the wearer of the absorbent article according to the invention. For example, extracts of aloe vera, marigold (calendula) and/or chamomile (matricaria) are suitable substances.

It is particularly advantageous if the care substances are enclosed in microcapsules. In this, the microcapsules can be mixed with the absorbent material which remains able to flow even after contact with a liquid. In this, the outer cover of the microcapsules should be configured in such a way that the said microcapsules burst open during wear of the absorbent article according to the invention, thus releasing the substance or the substances. Bursting can for example be caused by pressure, warmth and/or friction. Microencapsulation of substances has for example been known for quite some time in printing technology.

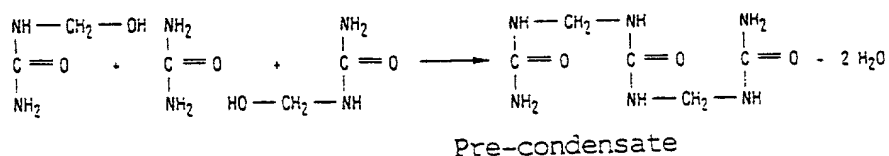
Polymethylene urea of a particular structure is a particularly suitable material for use in the absorbent body or the liquid storage of the absorbent article according to the invention. Even after having been in contact with a liquid, such as in particular urine or menstruation blood, polymethylene urea remains able to flow. The manufacture of polymethylene urea has been known for a long time and can for example take place by acid-catalysed gelling of a urea-formaldehyde solution or of a water-dilutable urea-formaldehyde concentrate, as described for example in Renner, Makromolekulare Chemie 149, 1 (1971) [Macromolecular Chemistry]. In addition, DE-AS-1907914 for example, describes the manufacture of fine-particle amino resin solid materials based on urea-formaldehyde condensates by acid-catalysed polycondensation in aqueous medium.

A desired particle size spectrum can be obtained by suitable process control and/or subsequent granulating. The form of particles, too, can be controlled whereby according to the invention, spherically-shaped particles are particularly suitable. Preferred particle sizes which can be used in the absorbent articles according to the present invention, are smaller than 2 mm; in particular smaller than 0.8 mm. The preferred ranges are 100 to 2000  $\mu\text{m}$  (0.1 to 2 mm), in particular 200 to 800  $\mu\text{m}$  (0.2 to 0.8 mm).

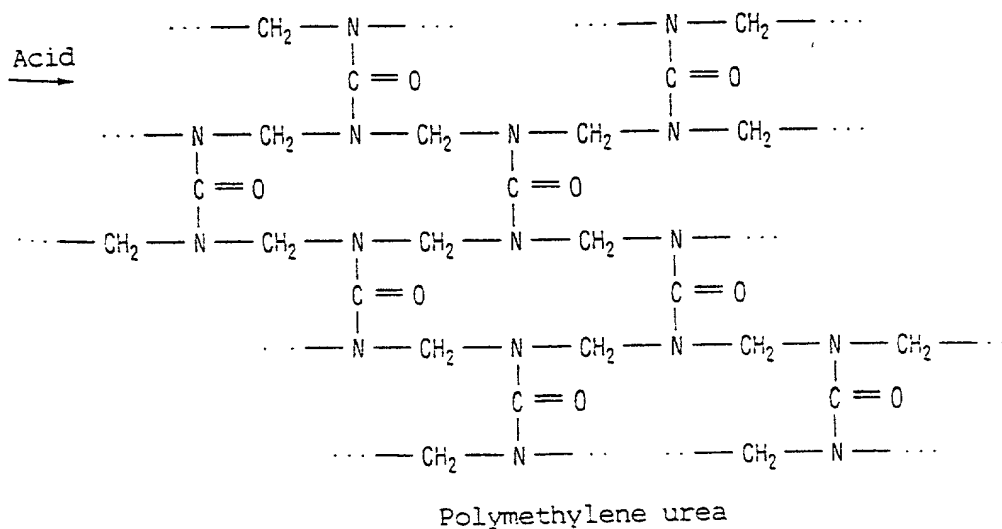
When using polymethylene urea polymers as materials which are able to flow in the absorbent articles according to the invention, it is important that during use of the articles no health-endangering substances can arise. In the case of the above-mentioned acid-catalysed polycondensation of formaldehyde and urea in aqueous medium to polymethylene urea, by-products containing ether groups can arise. If one thus tests a commercially available polymethylene urea material for formaldehyde content, then these by-products containing ether groups can be split and can lead to a positive reaction when testing for formaldehyde. The reaction process can be represented by a formula approximately as follows (as per Saechtling, Kunststoff-Taschenbuch [plastics paperback, German language] vol. 26, Carl Hanser Verlag, Munich, Vienna (1995)).



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30 As can be seen from the above formula diagram, during the conversion of urea and formaldehyde, depending on the stoichiometric ratio of the reactants, either monomethylol urea (ratio urea : formaldehyde 1 : 1) or dimethylol urea (ratio urea : formaldehyde 1 : 2) results. In the case of ratios between 1 : 1 and 1 : 2, both reaction products (mono-

35 methylol urea and dimethylol urea) are formed proportionally. Under the selected reaction conditions (basic, temperature

between 50 and 100°C), dehydration occurs and the reaction products convert to a precondensate. Subsequently, by means of acid catalysis, the precondensate is cross-linked to polymethylene urea.

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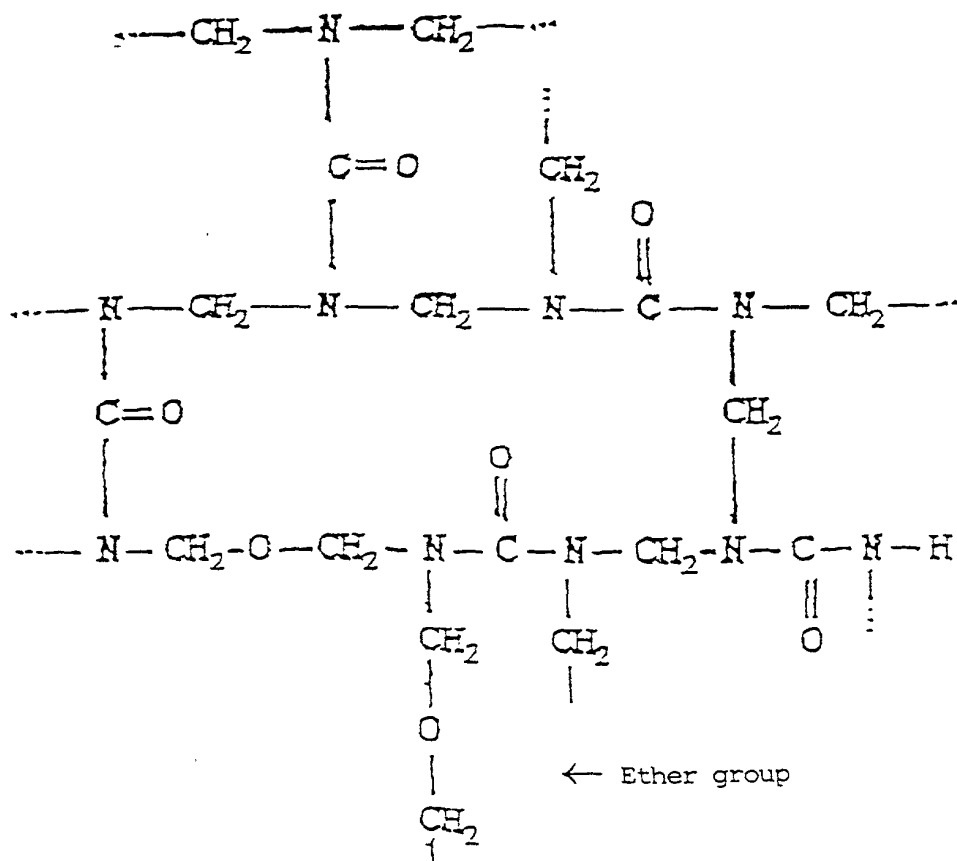
In the above-mentioned processes, apart from polymethylene urea, a smaller quantity of polymethylene urea comprising ether groups results, as shown in the following formula diagram:

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For use in the absorbent articles according to the invention it is advantageous to use material which has as few ether bridges as possible, ideally none at all.

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It is thus particularly preferred according to the invention, to use a polymethylene urea material free of ether groups in the absorbent article as an absorbent material and storage

material which remains able to flow. According to the invention, a traditional synthesis process in which in an addition reaction, urea and formaldehyde are converted to a precondensate and in which subsequently by way of acid-catalysed polycondensation, the polymethylene urea material is produced, is modified to such an extent that after the polycondensation step, the precipitated material is washed with an acid, preferably in the pH range between 1 and 2. Only following the additional acid-wash step can treatment with so-called "formaldehyde catchers" take place. In this way a polymethylene urea material free of ether groups or free of formaldehyde can be obtained.

Polymethylene urea in a particular form can for example be manufactured according to the following process: a 30% formaldehyde solution, urea, as well as if necessary additives, (e.g. protective colloids) are precondensed in a closed vessel while being stirred. The temperature in the mixing vessel is kept between 70 and 90°C; the pH value between 8 and 9. The production of the precondensate is completed after approximately 30 to 50 minutes. Subsequently, the precondensate is catalytically precipitated with acid, for example with hydrochloric acid, citric acid or sulphaminic acid. In this, the pH value of the acid used is preferably between 1 and 2. The precipitated product is polymethylene urea, which may however still contain ether groups. To remove these ether groups, the polymethylene urea is washed once more with an acid at pH 1 to 2, for example the above-mentioned acids hydrochloric acid, citric acid or sulphaminic acid. Subsequently, the polymethylene urea precipitate is washed with a neutral liquid and then treated with so-called formaldehyde rangers such as sodium sulfite, triethanolamine or a urea-formaldehyde copolymer. Then follows washing and drying of the material obtained, for example at 100 to 110°C. Further after-treatment can follow, for example targeted granulation. Granulation can be

supported by using natural substances, such as for example, cellulose, starch or their derivatives.

- 5 The granulated polymethylene material obtained in this way is free from ether groups and thus eminently suitable for use in absorbent articles because it is a particularly pure material which does not contain or release any hazardous materials or materials which cause skin irritation.
- 10 Apart from polymethylene urea material, the absorbent body of the absorbent article can also contain additional materials. In this, the material composition can be selected in such a way that the above-mentioned functions are taken over by a material or distributed to different materials. Such
- 15 materials may include: superabsorbers, superabsorbent material in particle shape, super absorbent fibres, zeolites, fibres made of cellulose, cell wool or artificial staple fibres of various length, polystyrene etc.
- 20 As regards the characteristics of polymethylene urea particles, it should be added that these particles have a zeolitic structure and are thus similar in effect to zeolites. Zeolites are commonly used in hygiene articles for odour absorption. If polymethylene urea is used as a liquid-
- 25 absorbent material or liquid-storing material, it is not necessary to use zeolites for odour absorption; this represents a further advantage of the absorbent article according to the invention. Furthermore, polymethylene urea is also advantageous in respect to the quantity of absorbent
- 30 material to be used. For example when compared with cellulose, the absorption performance of polymethylene urea is more than twice as effective. Also the costs for an absorbent body containing polymethylene urea are considerably lower than the respective costs for a cellulose absorbent
- 35 body. In comparison to polyacrylates which are used as



superabsorbers, the costs for polymethylene urea are in the same order of magnitude as those for cellulose.

- 5 Below, the test results of adsorption experiments with polymethylene urea (batch designation P 124), polymethylene urea/polyacrylate mixtures (batch designation P 124 + AK) and polyacrylate (batch designation AK) are described. The properties listed in table 1 were determined by means of a
- 10 tensiometer K121 by Messrs. Krüss.

Table 1

Specimen	$\delta$ [degrees]	$v$ rising $\times 10^2$ [g/s]	Max. water absorption capacity [g/g]
P124	56.8	3.266	16.1
P124+3% AK	66.1	2.42	20.3
P124+6% AK	83.1	0.715	15.5
AK	76.9	1.346	1.6

- 15 The second column of Table 1 shows the respective wetting angle  $\delta$  of the material investigated. The third column of Table 1 shows the rising velocity in the material, whereby the capillary rise was determined as a weight increase of the material.

- 20 As can further be seen from the fourth column of Table 1, 100% P124 has a maximum water absorption capacity of 16.1 g/g material. A mixture of 97% P124 and 3% AK increases the maximum water absorption capacity to 20.3 g/g, and when replacing a further 3% P124 by AK, the value sinks again to
- 25 15.5 g/g. All the above-mentioned values show that the respective materials are suitable for use in absorbent bodies of absorbent articles.

The maximum water absorption capacity of the respective materials was determined under conditions where no volume increase for the materials was possible, e.g. any moisture expansion was prevented. This explains the extremely low  
5 water absorption capacity of 1.6 g/g of the polyacrylate material.

The polymethylene urea P124 keeps its ability to flow up to a water absorption of 10.5 g/g. Only if the value of 10.5 g/g  
10 is exceeded, does the material commence to become slightly lumpy, up to the value of 12.8 g/g. If water absorption exceeds 12.8 g/g, the material structure becomes crumbly and at 18.8 g/g assumes a doughy, viscous consistency. In contrast to this, no ability to flow of pure polyacrylate  
15 could be determined, as this material gelled already at the slightest water absorption and led to a sticky bond or adhesion to the wall of the vessel.

Polymethylene urea/polyacrylate mixtures of a ratio 95:5  
20 showed slight moisture expansion of the material and the beginning of gel blocking effects. The higher the percentage of polyacrylate in the mixture, the stronger the moisture expansion and gel blocking observed. Even with high water absorption, no swelling, i.e. no volume increase, was  
25 detected with pure polymethylene urea P124. Finally, polymethylene urea and polyacrylate materials at maximum water carrying capacity were subjected to loads. While it was not possible to force water out of polymethylene urea, polyacrylate did give up water when subjected to extended  
30 load.

A further aspect of the invention relates to improved prevention of the cause of unpleasant odours during the use of absorbent articles. According to the invention it is  
35 proposed to place bactericidal, fungicidal and/or viricidal substances in an adsorptively bound or immobilised way onto

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or into the absorbent material which remains able to flow even after contact with liquid. If for example polymethylene urea is used as an absorbent material, then it comprises the zeolithic structure described above, i.e. apart from its external surface the material additionally also has a large internal surface which can range from 10 to 700 m<sup>2</sup>/g. In this it is important that the bactericidal, fungicidal and viricidal substances are immobilised on the absorbent material, because any release of the substances might lead to the wearer of the absorbent article experiencing skin irritation. Above all metabolism products of micro-organisms are responsible for the unpleasant odours in the use of absorbent articles. This means that odour formation can effectively be suppressed or prevented if growth and/or multiplication of the micro-organisms can be inhibited or if these micro-organisms can be killed. The substances mentioned enable inhibition and suppression of the growth of micro-organisms, so that in addition to the already good odour prevention properties of the polymethylene urea material itself, odour formation can be further prevented by the additional use of the above-mentioned bactericidal, fungicidal and viricidal substances. This provides the wearer of an absorbent article according to the invention with further security against undesirable side effects.

For example chlorinated levulinic acid or alkyldimethylbenzylammoniumhalogenides are suitable bactericidal substances.

Apart from the absorbent article which comprises the components able to flow even after contact with liquid, the absorbent body can comprise additional regions. In such a case the portion of the absorbent body which contains the material able to flow, is preferably configured as at least one core whose length  $l$  is smaller than the length  $L$  of the

absorbent article, and whose width  $w$  is smaller than the width  $W$  of the absorbent article.

5 The absorbent body can be connected to the underlying layer along the entire resting surface, for example by an adhesive means. However it might also be adequate if only a part of the absorbent body is connected with the underlying layer. Here again, the most various embodiments are imaginable, for example attachment in strips in that the absorbent body is  
10 fixed onto the supporting layer by means of adhesive strips. Generally speaking, the surface or the portion of the surface by which the absorbent body is connected to the underlying layer is smaller than the surface or the surface portion,  $l \times w$ . The length  $\lambda$  of the connection between absorbent body and  
15 underlying layer is thus smaller than or equal to the length  $l$ , and the width  $\beta$  of the connection between absorbent body and underlying layer is smaller than or equal to the width  $w$ .

20 The absorbent body can comprise one chamber or be divided into several sub-chambers which can be completely separate from each other or can communicate with each other whereby during pressure load on the chamber, particles can then also move to an adjacent chamber.

25 If the absorbent body and/or the core of the absorbent body is divided into several chambers, then the existing partition walls can be aligned in longitudinal and/or in transverse direction to the absorbent article. For example, division into two sub-chambers can be by a longitudinal or transverse  
30 wall. Two longitudinal walls would result in a three-chamber arrangement, and if a transverse wall is added to the two longitudinal walls, then the absorbent body or the core of it is divided into six chambers.

35 In this, one chamber can be filled to 100% with absorbent polymethylene urea material. It has however been shown to be

advantageous if less than the entire chamber containing the material which remains able to flow even after contact with liquid, is filled with material. Thus for example 50 to 100%, preferably 60 to 90%, and in particular 80% of a chamber can be filled with absorbent material. If the absorbent body is of multi-chamber design, then the respective preferred filling quantities apply to individual chambers. If less than 60% of a chamber is filled, then it is additionally advantageous if within individual chambers also so-called flow barriers are provided which prevent accumulation of all absorbent material in one corner of the chamber. Also, as already indicated above, the partition walls between individual chambers can comprise small apertures so that limited material exchange between individual chambers can take place, i.e. individual chambers can communicate with each other. It is in particular always necessary not to fill individual chambers completely where the chamber comprises expandable material, such as for example a superabsorber.

According to a further aspect of the present invention, where there are several chambers forming the absorbent body, these may be filled with various materials.

For example in a design of the absorbent body comprising three chambers in which the partition walls can be aligned in longitudinal or in transverse direction to the absorbent article, the central chamber can be filled with polymethylene urea or polymethylene urea/superabsorber mixtures, while (in the case of longitudinal partition walls) the laterally situated chambers or (in the case of transverse partition walls) the chambers situated at the front and rear ends can be filled with superabsorbers.

If mixtures for example of polymethylene urea and superabsorbers are used, care must be taken that these mixtures cannot unmix, because this could lead to not all

potentially absorbable or storable material being useable, i.e. so-called "dead material" might result.

5 The present invention thus provides an absorbent article which adapts very well to body contours. The articles are further characterized in that where suitable absorbent materials for the absorbent body are used, they do not experience any volume increase upon contact with a liquid, i.e. they do not expand when moistened. Finally, the articles  
10 according to the invention can also optimally absorb liquid in their deformed condition.

Also the absorbent articles according to the invention optimally adapt to the body contours of the wearer. Thus the  
15 article can be worn very close to the body (anatomical form-fitting) which has the advantage that liquid is absorbed immediately upon exuding from the body, thus preventing the wearer from experiencing any feeling of wetness of the skin. The wearer's feeling of dryness of the skin is also achieved  
20 in that with the absorbent articles according to the invention the absorbent material is purposefully centred in the absorbent articles. Finally, the embodiment according to the invention, of the absorbent articles, makes it possible, in the case of a sanitary napkin, for its ends to be kept  
25 extremely thin thus allowing very discrete use of a respective article.

Apart from the element, referred to above as an absorbent body, which at the same time serves as a liquid-storage layer  
30 (= primary storage), the absorbent article according to the invention can also comprise a further storage layer (so-called secondary storage). This further storage layer is preferably constructed as a web between the absorbent body and the liquid-impermeable layer disposed away from the  
35 wearer's body. This material forming the additional storage layer can also be absorbent in order to bring about better

liquid-distribution. This additional storage layer is only intended for "emergencies" if the absorbent body (primary storage) for whatever reasons was to exceed its capacity limit. Materials suitable for the additional storage layer  
5 (secondary storage), are for example coform materials, cellulose, cellulose-fibre mixtures (air laid), non-woven materials or tissue cotton-wool.

The absorbent articles according to the invention, with the  
10 novel absorbent body, can in particular be used in the area of feminine hygiene, for example as a sanitary napkin, in particular an ultra-thin sanitary napkin or a panty liner. Apart from this, the absorbent article according to the invention can however also be designed as a child's  
15 disposable nappy/diaper, or an incontinence pad.

If the absorbent article is an article according to the first aspect of the invention, i.e. if it comprises a liquid-permeable cover layer which during use of the article is  
20 disposed towards the body, then underneath this liquid-permeable layer there can be another cover layer which comprises a central aperture (so-called port hole) located above the absorbent body. Respective absorbent articles are for example described in the German patent application No.  
25 19640451. This port hole design is in particular advantageous for feminine hygiene articles.

The absorbent article disclosed in the above-mentioned German patent application can comprise the following structure. On  
30 the side disposed away from the body when the absorbent article is in use, there is a liquid-impermeable layer. Above this liquid-impermeable layer there is a primary storage layer. Above it there is a secondary storage layer. Above the secondary storage layer there is a compensation layer and  
35 above the compensation layer there is a cover layer comprising a central aperture. The absorbent articles

according to the present invention can also comprise a respective cover layer comprising an aperture. Finally, the absorbent article according to the present invention further comprises an upper, liquid-permeable layer which is disposed  
5 towards the body when the article is used. The secondary storage layer can comprise at least one compressed region.

For example cellulose is a material suitable for the secondary storage layer. Local compressed regions in the  
10 secondary storage can for example be obtained by embossing grooves into the storage area. The storage material positioned underneath the embossed grooves is thus compressed and the grooves contribute to a directed liquid-distribution on the storage layer or in the absorbent article.

The cover layer comprising the central aperture is for example made from a mixture of cellulose and polymerised alkene. It is advantageous if the respective mixtures contain at least 50% by weight of polymerised alkene. Very good  
15 results are achieved if the content of polymerised alkene is 50-80% by weight, in particular 60% by weight. The cover layer may also be made from two layers, in such a way that a first layer made of cellulose and polymerised alkene is applied to a second carrier layer made of polymerised alkene.  
20 In this, the first layer made from a mixture of cellulose and polymerised alkene is connected to the liquid-impermeable layer which, when the article is used, is disposed towards the body, and the second carrier layer is connected to the compensation layer. Polyethylene, polypropylene and mixtures  
25 of polyethylene and polypropylene are preferred polymerised alkenes. Furthermore, the cover layer can comprise a pigment, such as for example titanium oxide. It is advantageous if the material of the compensation layer is made from a non-woven material. The non-woven material can comprise polymerised  
30 alkene and/or bicomponent fibres. The compensation layer on the surface disposed towards the storage layer can also be  
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coated with a surface-active substance, which may for example contain silicon. The primary storage layer can for example comprise a UCTAD material (uncreped through air dried material), tissue cotton-wool or a polymeric alkene. It is  
5 advantageous if the primary storage layer is constructed in such a way that its marginal areas are folded in in such a way that they mutually overlap.

Both the liquid-impermeable layer and the liquid-permeable  
10 layer can be constructed from a polymerised alkene, such as for example polyethylene, polypropylene or a mixture thereof. For attachment of the absorbent article according to the invention to a garment, the liquid-impermeable layer may  
15 comprise at least one adhesion element and/or an adhesive layer. Furthermore, the absorbent article according to the invention may also comprise laterally arranged wings.

The invention is explained in more detail below by means of the accompanying drawings in which:

20 Fig. 1 is a perspective view of an absorbent article according to the invention in the form of a sanitary napkin;

25 Fig. 2 is a perspective view of an absorbent article according to the invention in the form of a sanitary napkin, in partial section view;

30 Fig. 3 is a cross-section through one embodiment of the absorbent article according to Fig. 1 along the line A-A of Fig. 1;

35 Fig. 4 is a cross-section through a further embodiment of an absorbent article according to the invention in the form of a sanitary napkin;

Fig. 5 is a longitudinal section through one embodiment of the absorbent article according to Fig. 1, along the line B-B of Fig. 1;

5 Fig. 6 is a diagrammatic view of the length and width ratios of an absorbent article according to the invention and a respective core of an absorbent element;

10 Fig. 7a-z is a top view of shapes which the absorbent body or the core of the absorbent body of an absorbent article according to the invention, can assume;

15 Fig. 8a-c is a view of the chamber layouts (in longitudinal direction) of the absorbent body or the core of the absorbent body of an absorbent article according to the invention;

20 Fig. 8d-f is a view of the chamber layouts (in transverse direction) of the absorbent body or the core of the absorbent body of an absorbent article according to the invention;

25 Fig. 9 is a view of the chamber layouts (in longitudinal and transverse directions) of the absorbent body or the core of the absorbent body of an article according to the invention;

30 Fig. 10a-d is a view of deformation possibilities of the absorbent body or the core of the absorbent body of an article according to the invention;

35 Fig. 11a shows the torque of a polymethylene urea powder during wetting with an increasing quantity of blood substitution solution (BSS);

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- 5      Fig. 11b      shows the torque of a mixture of 8 parts by weight of polymethylene urea and 1 part by weight of polyacrylate (SAP) during wetting with an increasing quantity of blood substitution solution (BSS);
- 10     Fig. 11c      shows the torque of a mixture of 4 parts by weight of polymethylene urea and 1 part by weight of polyacrylate (SAP) during wetting with an increasing quantity of blood substitution solution (BSS);
- 15     Fig. 11d      shows the torque of a mixture of 2 parts by weight of polymethylene urea and 1 part by weight of polyacrylate (SAP) during wetting with an increasing quantity of blood substitution solution (BSS);
- 20     Fig. 11e      shows the torque of a mixture of equal parts by weight of polymethylene urea and polyacrylate (SAP) during wetting with an increasing quantity of blood substitution solution (BSS);
- 25     Fig. 11f      shows the torque of a mixture of 1 part by weight of polymethylene urea and 2 parts by weight of polyacrylate (SAP) during wetting with an increasing quantity of blood substitution solution (BSS);
- 30     Fig. 12      is a diagram illustrating the maximum torques of polymethylene urea or various mixtures of polymethylene urea/SMH during wetting with a blood substitution solution (BSS);

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Fig. 13 is a perspective view of a further absorbent article according to the invention in the form of a sanitary napkin;

5 Fig. 14 is a cross-section through the absorbent article according to Fig. 13 along the line IV-IV;

10 Fig. 15 is a perspective view of a further absorbent article according to the invention in the form of a sanitary napkin;

Fig. 16 is a cross-section through the absorbent article according to Fig. 15 along the line VI-VI;

15 Fig. 17 is a perspective view of a further absorbent article according to the invention in the form of a sanitary napkin;

20 Fig. 18 is a cross-section through the absorbent article according to Fig. 17 along the line II-II.

Fig. 19 is a perspective view of a further embodiment of the absorbent article according to the invention, in the form of a sanitary napkin; and

25 Fig. 20 is a cross-section through the absorbent article according to Fig. 19 along the line XX-XX.

30 Although the absorbent article according to the invention is shown below in detail in the form of sanitary napkins, it is evident that the present invention is not restricted to sanitary napkins for feminine hygiene but includes all absorbent hygiene articles.

35 Fig. 1 shows a sanitary napkin 10 according to the invention comprising a frontal region 12, a middle region 14 and a rear

region 16. The liquid-permeable layer 18 disposed towards the wearer's body when the sanitary napkin 10 is in use, and the liquid-impermeable layer 20 disposed away from the wearer's body, are interconnected in the marginal area 22 of the sanitary napkin 10. In the centre, the absorbent body (not visible), extends in longitudinal direction of the sanitary napkin 10; the said absorbent body results in the liquid-permeable layer 18 in the centre of the sanitary napkin being raised in relation to the frontal region 12 and the rear region 16. Also visible are two longitudinal grooves 26 in the central region 24 which on the one hand reflect the chamber layout of the absorbent body and on the other hand contribute to directional liquid-distribution when the sanitary napkin is in contact with a liquid.

Fig. 2 provides a perspective view of an absorbent article 10 according to the invention in partial section view. Shown again are the frontal region 12, the middle region 14 and the rear region 16 of the article. The liquid-permeable layer 18 and the liquid-impermeable layer 20 (garment protection film) are interconnected in the marginal area 22. The core 28 of the absorbent body of the article according to the invention is arranged in the central region of the said absorbent body and extends in longitudinal direction of the article. The core comprises a (liquid-permeable) outer cover 30 made from a non-woven material. The material 32 which remains able to flow even after contact with a liquid, in the present case polymethylene urea with a particle size between 200 and 800  $\mu\text{m}$ , is enclosed in the outer cover; the individual particles are largely spherical in shape. In the embodiment shown in Fig. 2, the outer cover 30 is almost entirely filled with material 32. This does not pose any problems because, even if contacted with a liquid, this material is not subject to moisture expansion (swelling) and there is thus no danger of the outer cover 30 bursting.

The longitudinal grooves 26 extend in longitudinal direction of the absorbent article 10. The outer cover 30 of the core comprises tied-in areas 34 which cause a certain division into compartments of the absorbent material 32. In this, the  
5 core is divided into a central chamber 36 and lateral chambers 38, 40. As is clearly evident in Fig. 2, the delimitation walls of the individual chambers do not reach all the way to the base of the outer cover 30, so that a limited material exchange between individual chambers is  
10 possible. In the embodiment shown in Fig. 2, the outer cover 30 is made from two parts which are interconnected in the marginal area 42. This construction facilitates filling of the core with absorbent material.

15 In the embodiment of the article according to the invention shown in Fig. 2, the core 28, oval in shape, of the absorbent body, is also backed by an absorbent cellulose material 44. This cellulose material on the one hand contributes to wearer  
20 comfort, and on the other hand serves as reserve storage (secondary storage) in case the storage capacity of the core filled with polymethylene urea material, which remains able to flow even after having been in contact with a liquid, is exceeded. Normally, this reserve storage will however not  
25 have to be used since investigations show that for example the large majority of all sanitary napkins need to absorb less than 5 ml of liquid and for this the storage capacity of the core is adequate in every case.

30 When the article 10 according to the invention is in contact with blood, the blood is first of all distributed with the assistance of the longitudinal grooves 26. The blood then penetrates the liquid-permeable layer 18 and through the outer cover 30 enters the core 28 containing the material 32 where it is retained.

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Fig. 3 shows a cross-section, along the line A-A in Fig. 1, through the absorbent article according to the invention. Viewed from top to bottom, under the liquid-permeable layer 18 of the core 28, the absorbent body can be seen. The said core 28 is enclosed by the outer cover 30 and filled with the polymethylene urea material 32 which remains able to flow even after contact with a liquid. Below the core 28 there is a secondary storage layer made of cellulose material 44 (serving predominantly as a reserve or secondary storage), and the absorbent article is closed off below by the liquid-impermeable layer 20 which consists of polyethylene. A further special feature of the embodiment shown in Fig. 3 consists of the outer cover 30 featuring tied-in areas 48 on the bottom too; the said tied-in areas being aligned with the tied-in areas 34 at the top. This results in a still more pronounced chamber layout of the core of the absorbent body, to a limited extent enabling material exchange between individual chambers. The liquid-permeable layer 18 and the liquid-impermeable layer 20 are interconnected in the marginal area 22. In the present case, this connection of the layers has been achieved by bonding the layers by an adhesive means. It is however also possible to interconnect the layers in other ways, for example by ultrasound or heat sealing. The two layers in the marginal area 42 of the outer cover 30 are bonded to each other in a similar way to that used in the marginal area 22.

Fig. 4 shows a cross-section through a further embodiment of an absorbent article according to the invention. The same elements are described with the same reference numbers in Figs. 3 and 4. In the embodiment according to Fig. 4, the lateral chambers 38, 40 are completely closed off from the central chamber 36 so that no exchange of material 32 is possible between the chambers. The chamber layout is achieved by the upper area 30a of the outer cover 30 and the lower area 30b of the outer cover 30 contacting each other at

points 52, 54. A permanent connection is attained by sewing the upper or the lower outer cover layer. The chamber layout could for example also be achieved by bonding the upper area 30a to the lower area 30b. A further characteristic of the embodiment shown in Figs. 3 and 4 consists of the presence of upper voids 60. The liquid which has entered can distribute itself very well in longitudinal direction in these voids, thus resulting in an even storage of the said liquid across the entire absorbent body. This arrangement allows optimal use of the absorption capacity and storage capacity of the core.

In Fig. 4, the reference number 58 indicates the upper edge of the secondary storage layer 44. If there are no indentations present in the liquid-impermeable layer 20, then small lower voids 62 can form between individual chambers of the absorbent body.

In addition, the absorbent body of the absorbent article according to the invention can also comprise a subdivision into chambers in such a way that there are subdivided areas (as shown in Fig. 4; compare numbers 52, 54) besides areas which allow a material exchange between chambers (as can be seen from Fig. 3, areas indicated by reference numbers between 34 and 48). This then leads to the formation of various areas, in longitudinal direction of the absorbent article, between the central chambers 36 and the lateral chambers 38, 40. In places, material exchange between chambers is possible (if the chambers are not completely separated from each other, as shown in Fig. 3); in other places material exchange is suppressed (as shown in Fig. 4, numbers 52, 54).

Fig. 5 is a longitudinal section through the absorbent article according to Fig. 1 along the line B-B in this figure. The liquid-permeable layer 18 and the liquid-



impermeable layer 20 are interconnected in the marginal area 22. The central chamber of the core containing the polymethylene urea material 32, is also shown in longitudinal section view.

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Fig. 6 shows how to favourably select the dimensions  $w$  and  $l$  of the core of the absorbent body in relation to the dimensions  $W$  and  $L$  of the absorbent article. It is advantageous in any case if  $w$  is smaller than  $W$  and  $l$  is smaller than  $L$ .

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Fig. 7 a to z shows 25 different possibilities of core design. Depending on the function of the absorbent article according to the invention, a suitable core can be selected. In the case of a "dog bone" structure, as shown in Fig. 1, it would be advantageous for example to use a similarly shaped core; see for example Fig. 6. But an oval shape (Fig. 7b) of the core can also be used to advantage (compare Fig. 1).

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Figs. 8 and 9 show possibilities for subdividing (chamber layout) the core. The design shown in Figs. 8a to c relates to longitudinal chambers, and embodiments according to Figs. 8d to f relate to transverse chambers. Fig. 9 shows longitudinal and transverse chambers at the same time. The chamber design according to Fig. 8b corresponds to that shown in Figs. 2 to 4.

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Fig. 10 shows various deformations of the absorbent body under lateral pressure load and pressure load from above. In this, an oval core, shown in top view, can change to an hour-glass or dog-bone shaped core (Fig. 10a) when lateral pressure forces are applied to the core by the wearer's thighs (compare arrows in the left diagram of Fig. 10a). The original width  $w_1$  (left diagram in Fig. 10a) in the step area is reduced to the width  $w_2$  (right diagram in Fig. 10a). This demonstrates the particular ability of the absorbent article

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according to the invention to fit very well to the anatomical contours of the wearer.

Fig. 10b shows the deformations illustrated in Fig. 10a of a core of an absorbent article in cross-section. This Fig. also shows clearly how absorbent material can be rearranged from the two laterally positioned chambers into the central chamber. The arrows indicate the direction of material movement.

Fig. 10a shows that during lateral pressure load, the outer shape and cross-sectional contours of the core area change but that the length  $l$  of the said core area essentially remains unchanged.

Fig. 10c shows the deformation of the core of the absorbent body during pressure load from above (arrow from above). It shows clearly how, by reducing the thickness of the core ( $D_2 < D_1$ ), material from the central region can be rearranged to lateral regions (arrows to the left and right). In this, the width  $w$  of the core remains essentially unchanged.

If the central core comprises a chamber layout as shown in Fig. 10d, then during pressure load from above (arrow from above) the thickness of the middle (central) chamber will be reduced and material will move to laterally located chambers, indicated by the arrows to the left and right (compare also Fig. 3).

Figs. 11e to f shows the torque (in Nm) when stirring polymethylene urea powder or polymethylene urea/polyacrylate (superabsorber) mixtures with the addition of certain quantities of blood substitution solution (BSS). Fig. 11a illustrates pure polymethylene urea and shows a maximum of approx. 2 Nm at approx. 1 ml BSS. Similar conditions result with 8 parts by weight of polymethylene urea to 1 part by

weight of polyacrylate (SAP) as shown in Fig. 11b and with a mixture of 4 parts by weight of polymethylene urea and 1 part by weight of polyacrylate (SAP) (Fig. 11c), with the maximum rising slightly at 1 ml BSS (Fig. 11b approx. 2.4 Nm and Fig. 11c approx 2.8 Nm).

When examining mixtures comprising 2 parts by weight of polymethylene urea and 1 part by weight of polyacrylate (SAP), then it becomes evident that the 1 ml maximum rises to approx. 3.2 Nm, and a second maximum of approx. 4.2 Nm occurs at approx. 7 ml BSS (Fig. 11d). With a mixture of equal parts by weight of polymethylene urea and polyacrylate (SAP), a first maximum of approx. 2.5 Nm occurs at about 1.8 ml BSS, and a second maximum of approx. 6 Nm occurs at approx. 8.3 ml BSS (Fig. 11e). With a mixture containing 1 part by weight polymethylene urea and 2 parts by weight polyacrylate (SAP), this second maximum rises to approx. 8 Nm at approx. 8.3 ml BSS (Fig. 11f).

It is evident from the data shown in Figs. 11a to f that (after overcoming a first maximum at approx. 1 ml liquid-supply) pure polymethylene urea and mixtures of up to 4 parts per weight of polymethylene urea with 1 part by weight SAP can be supplied with larger quantities of BSS (up to 14 ml) without a significant friction resistance of the particles of absorbent material resulting. This is an important indicator for the high wearer comfort of the absorbent articles containing the respective materials as an absorbent. Since most sanitary napkins for feminine hygiene, as has been mentioned before, do not have to absorb more than 5 ml liquid, the pronounced second maximum, which occurs in mixtures containing less than 2 parts by weight of polymethylene urea per part by weight of SAP, does not have any negative effect.

Finally, Fig. 12 shows the maximum torque in Nm at commencement of wetting with BSS and after completed homogenisation of polymethylene urea/polyacrylate (SAP) mixtures.

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Fig. 13 shows a sanitary napkin 100 of the invention, comprising a frontal region 102, a middle region 104 and a rear region 106. A layer 110 made from a soft coform material is applied to a liquid-impermeable layer (not shown in Fig. 13). The layer 110 is connected to the supporting liquid-impermeable layer by an adhesive means 118. In the marginal area, the two layers are additionally connected to each other by thermal-mechanical means or by ultrasound. On the one hand, the layer 110 serves to increase the wearer comfort of the absorbent article by its softness; on the other hand, the layer 110 can also serve as a reserve or secondary storage if liquid to be absorbed reaches the marginal areas of the absorbent article. The layer 110 comprises a central absorbent body and storage body 114. The absorbent body comprises a liquid-permeable outer cover. The outer cover comprises a liquid absorbent material which remains able to flow even after contact with a liquid.

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Fig. 14 shows in detail the structure of the absorbent article according to the invention according to Fig. 13, with Fig. 14 showing a cross-section along line IV-IV shown in Fig. 13. Fig. 14 shows the liquid-impermeable rear cover layer 116 made from polyethylene. On the one hand, the cover layer 116 serves as a support for the overlaying layers (arranged in closer proximity to the wearer's body) of the absorbent article. On the other hand the cover layer 116 serves as a garment protection film which protects the wearer's undergarments from soiling by bodily fluids. In the marginal area 112, the liquid-impermeable layer 116 and the layer 110 made from a soft coform material, are stamped together. The absorbent body 114 is attached to the layer

110. The absorbent body 114 comprises an outer cover 120 made from a non-woven material which comprises a material 122 which remains able to flow even after contact with a liquid, namely polymethylene urea in spherical shape with a particle diameter ranging between 200 and 800  $\mu\text{m}$ . The outer cover 120 is connected to the layer 110 by means of seams 124. On the one hand, the seams 124 cause the layer 110 to be held to the absorbent body 114 and on the other hand also cause a certain division into compartments of the absorbent body 114. In this, as a result of the seams 124, in the absorbent body according to the embodiment shown in Figs. 13 and 14, the absorbent body is not divided into two or more completely separate regions because the seams are not arranged right through. The type of stitching used to attach the absorbent body 114 to the coform layer 110, shown in Fig. 14, ensures that the supporting liquid-impermeable layer 116 remains intact and can fulfil its function as a garment protection film. The absorbent body 114 comprises marginal areas 126 where a section 120a of the outer cover 120 facing the coform layer, is connected by an adhesive means to a section 120b of the outer cover 120 facing the body. Prior to filling the absorbent body 114 with the absorbable material 122 with storage properties, the sections 120a and 120b are first partly connected to each other in such a way that a filling aperture remains. Subsequently, the material 122 is fed in through the filling aperture, up to the desired degree of filling; in the present case 80% of the theoretical total filling capacity; and subsequently the areas 120a and 120b are also connected to each other in the filling aperture section, resulting in the completed absorbent body 114 which is subsequently fixed by means of stitches to the coform layer 110.

The advantage of the absorbent article 100 according to the invention as shown in Figs. 13 and 14, when compared to traditional absorbent articles can be found in that on the

one hand the absorbent body and the absorbent material contained therein are very easily accessible because only the outer cover is between the absorbent material and the wearer's body; and on the other hand the unrestricted and exposed position of the absorbent body makes it possible for the said absorbent body to optimally adapt to the anatomical contours of the wearer. In this way, the article according to the invention ensures very high wearer comfort.

Figs. 15 and 16 also show a sanitary napkin which in principle has the same design as the embodiments shown in Figs. 13 and 14, with the embodiment in Fig. 16 showing a cross-section through the article along the line VI-VI in Fig. 15. The reference numbers in Figs. 15 and 16 correspond to those in Figs. 13 and 14. Similarly, the materials described in conjunction with Figs. 13 and 14 correspond to those in Figs. 15 and 16. As can be seen from the perspective views in Figs. 13 and 15, the embodiments according to Figs. 13 and 15 differ in the shape of the absorbent body 114. Whereas the absorbent body 114 according to Fig. 13 is of elongated oval shape, the absorbent body according to Fig. 15 is of elongated lanceolate shape. This increase in size of the absorbent body further increases the liquid-absorption capacity of the absorbent article according to the invention. As can be seen from Fig. 16, the absorbent body 114 is connected to its underlying layer 110 merely by a central seam 124 whereby the adaptability of the absorbent body 114 to various wearer situations is still further improved.

Figs. 17 and 18 finally show a further modification of the absorbent article according to the invention, with Fig. 17 showing a perspective view and Fig. 18 a view along the line II-II in Fig. 17. The reference numbers used in Figs. 13 and 14 denote corresponding components in Figs. 17 and 18. The materials described in conjunction with Figs. 13 and 14 also correspond to those in Figs. 17 and 18.

5 The special feature of the embodiment shown in Figs. 17 and 18 of an absorbent article according to the invention consists of the division into three parts of the absorbent body into a central section 114 and two lateral sections 114a and 114b. As can be seen in Fig. 18, the absorbent body comprises three sections 114, 114a and 114b of the absorbent body which sections are completely separate from each other. Channels 126, 128 aligned in longitudinal direction are arranged between the central absorbent body 114 and the lateral absorbent bodies 114a and 114b. This embodiment of the absorbent article according to the invention ensures particularly good leakage protection because, if the central absorbent body 114 should "spill over", there are still the lateral absorbent bodies 114a, 114b available for liquid absorption. This type of absorbent article is thus particularly suitable for situations in which large quantities of liquid need to be absorbed and stored in a relatively short period of time. In this, the channels 126, 128 support distribution of the liquid in longitudinal direction of the absorbent article, i.e. the total available capacity for absorption and storage is used even more effectively because in close proximity to the central contact area, even marginal areas and terminal areas of the absorbent body can be used optimally for liquid storage.

30 A further special embodiment of the absorbent article according to the invention is shown in Figs. 19 and 20. Again, the article is a sanitary napkin, shown in perspective view in Fig. 19 and in cross-section in Fig. 20. The article comprises a liquid-impermeable layer 116, made of polyethylene, which is disposed away from the wearer's body when the said article is in use. Arranged on this layer 116 is a layer 110 made of soft coform material which on the one hand serves to increase the wearer comfort of the article. On the other hand, this layer 110 can also serve as reserve

storage or secondary storage which absorbs and stores liquid not absorbed and retained in the absorbent body 114.

5 The absorbent body 114 in turn is surrounded by a liquid-permeable layer or outer cover 120 made from a non-woven material. The liquid-absorbent and liquid-storing material 122 in the absorbent body 114 is polymethylene urea material free from ether groups and free from formaldehyde groups, whereby the absorbent body is filled with the polymethylene  
10 urea material up to 70% of its theoretical capacity. This degree of filling ensures very good adaptability of the article to the wearer's body contours.

15 The absorbent body 114 is connected to the layer 110 underneath it and via this layer with the liquid-impermeable layer 116 by way of a seam or of adhesion 124. The reference number 112 designates the marginal area connecting the layers 110 and 116.

20 The embodiment shown in Figs. 19 and 20 is characterized by the arrangement of the liquid-permeable cover layer 130.

25 This cover layer comprises folds, marked with the reference number 132, which extend in longitudinal direction of the article. The folding of the layer 130 extends underneath the absorbent body 114 up to a further folding 134 from where the cover layer again extends in the direction of the margin of the article. Between the folding 134 and the marginal area of the article, the layer 130 is connected by means of adhesion  
30 with the underlying layer 110. This special arrangement of the cover layer 130 ensures good mobility and adaptability of the absorbent body and of the entire article to the wearer's body contours.



CLAIMS

1. An absorbent article comprising
- 5 a liquid-permeable layer (18) disposed towards the wearer's body when the said article is in use;
- a liquid-impermeable layer (20) disposed away from the wearer's body when the said article is in use; as well
- 10 as
- an absorbent body arranged between the liquid-permeable layer (18) and the liquid-impermeable layer (20),
- 15 characterized in that
- the absorbent body comprises an absorbent material (32) which remains able to flow even after having been in contact with a liquid.
- 20
2. An absorbent article comprising
- a liquid-impermeable layer (116) disposed away from the body when the article is in use, as well as an
- 25 absorbent body (114; 114a, 114b) covered by a liquid-permeable layer and comprising an absorbent material (122) which remains able to flow even after contact with liquid, with the absorbent body (114; 114a, 114b) being connected to the liquid-impermeable layer (116)
- 30 in a central area of the said layer.
3. An absorbent article according to claim 2, characterized in that the connection between the absorbent body (114; 114a, 114b) and the liquid-impermeable layer
- 35 (20; 116) is made by an adhesive means.

4. An absorbent article according to one of claims 2 or 3, characterized in that the connection between the absorbent body (114; 114a, 114b) and the liquid-impermeable layer (11b) is made by a seam (124) or by several seams (124).
- 5.
5. An absorbent article according to one of the preceding claims, characterized in that an absorbent, soft material (110) which serves as a secondary storage is arranged on the side of the liquid-impermeable layer (20; 116) disposed towards the body of the wearer.
- 10.
6. An absorbent article according to claim 5, characterized in that the soft material (110) serving as a secondary store, is a coform material, an airlaid material, tissue cotton-wool and/or a non-woven material, in particular a spin-bonded fabric or card web.
- 15.
7. An absorbent article according to one of the preceding claims, characterized in that the absorbent material (32; 122) which remains able to flow even after contact with a liquid is embedded in a matrix made of fibrous material.
- 20.
8. An absorbent article according to claim 7, characterized in that the absorbent material (32; 122) which remains able to flow even after contact with a liquid is mixed into the fibrous material in a homogenous way.
- 25.
9. An absorbent article according to claim 7 or 8, characterized in that the absorbent material (32; 122) which remains able to flow even after contact with a liquid is embedded between layers of fibrous material.
- 30.

10. An absorbent article according to one of claims 7 to 9, characterized in that the fibrous material is cellulose, a cellulose/polypropylene mixture and/or a coform material.
- 5
11. An absorbent article according to one of claims 7 to 10, characterized in that the ratio of absorbent material (32; 122) which remains able to flow even after contact with a liquid, to fibrous material, is between 1 to 25% by weight to 99 to 75% by weight.
- 10
12. An absorbent article according to claim 11, characterized in that the ratio of absorbent material (32; 122) which remains able to flow even after contact with a liquid, to fibrous material, is between 5 to 20% by weight to 95 to 80% by weight.
- 15
13. An absorbent article according to claim 12, characterized in that the ratio of absorbent material (32; 122) which remains able to flow even after contact with a liquid, to fibrous material, is between 10 to 15% by weight to 90 to 85% by weight.
- 20
14. An absorbent article according to one of the preceding claims, characterized in that the absorbent body (114; 114a, 114b) apart from the absorbent material (32; 122) which remains able to flow even after contact with a liquid, contains at least one care substance.
- 25
15. An absorbent article according to claim 14, characterized in that the care substance of which there is at least one is an extract of aloe vera, marigold and/or chamomile.
- 30

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16. An absorbent article according to one of claims 14 or 15, characterized in that the care substances are enclosed in microcapsules.
- 5 17. An absorbent article according to claim 16, characterized in that the care substances are enclosed in the microcapsules in such a way that when the absorbent body is worn, the care substances are releasable by forces acting upon it and/or by body warmth.
- 10 18. An absorbent article according to one of the preceding claims, characterized in that bactericidal, fungicidal and/or viricidal substances are applied in an immobilised way on or in the absorbent material which remains able to flow even after contact with liquid or in an adsorptive way on the absorbent material.
- 15 19. An absorbent article according to claim 18, characterized in that chlorinated levulinic acid and/or alkyl dimethylbenzyl ammonium halogenides are applied as bactericidal substances.
- 20 20. An absorbent article according to one of the preceding claims, characterized in that the absorbent material (32; 122) which remains able to flow even after contact with a liquid, keeps its ability to flow up to at least 25 10 ml liquid per gram of material.
- 30 21. An absorbent article according to one of the preceding claims, characterized in that the absorbent material (32; 122) comprises spherical particles.
- 35 22. An absorbent article according to claim 21, characterized in that the diameter of the spherical particles is between 100 and 2000  $\mu\text{m}$ , in particular between 200 and 800  $\mu\text{m}$ .

23. An absorbent article according to one of the preceding claims, characterized in that the absorbent material (32; 122) comprises at least in part polymethylene urea.
24. An absorbent article according to claim 23, characterized in that at least one third of the absorbent material (32; 122) comprises polymethylene urea.
25. An absorbent article according to claim 23, characterized in that at least half of the absorbent material (32; 122) comprises polymethylene urea.
26. An absorbent article according to claim 23, characterized in that at least two thirds of the absorbent material (32; 122) comprises polymethylene urea.
27. An absorbent article according to claim 23, characterized in that at least 80% of the absorbent material (32; 122) comprises polymethylene urea.
28. An absorbent article according to claim 23, characterized in that the absorbent body is made from polymethylene urea.
29. An absorbent article according to one of claims 23 to 28, characterized in that the polymethylene urea material is free of ether groups and formaldehyde.
30. An absorbent article according to one of claims 1 to 27 or 29, characterized in that the absorbent material (32, 122) comprises a superabsorbent material.

31. An absorbent article according to claim 30, characterized in that the superabsorbent material is a polyacrylate.
- 5 32. An absorbent article according to one of the preceding claims, characterized in that the absorbent body comprises at least one core (28) which contains the absorbent material (32; 122) which remains able to flow even after contact with a liquid, whereby preferably  
10 the length  $l$  of the core (28) is smaller than or equal to the length  $L$  of the absorbent article, and the width  $w$  of the core (28) is smaller than or equal to the width  $W$  of the absorbent article.
- 15 33. An absorbent article according to one of the preceding claims, characterized in that the absorbent body comprises at least two chambers (36, 38, 40; 114; 114a, 114b) which are separated from each other by at least one wall.
- 20 34. An absorbent article according to claim 33, characterized in that the wall, of which there is at least one, is aligned in longitudinal direction of the absorbent article.
- 25 35. An absorbent article according to claim 33, characterized in that the wall, of which there is at least one, is aligned in transverse direction of the absorbent article.
- 30 36. An absorbent article according to claim 33, characterized in that the absorbent body is divided into compartments by at least one wall aligned in longitudinal direction of the absorbent article, and by  
35 at least one further wall aligned in transverse direction of the absorbent article.

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37. An absorbent article according to one of claims 33 to 36, characterized in that the core (28), of which there is at least one, of the absorbent body, is subdivided into chambers.

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38. An absorbent article according to one of the preceding claims, characterized in that it is a hygiene article.

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39. An absorbent article according to claim 38, characterized in that it is a feminine hygiene article.

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40. An absorbent article according to claim 39, characterized in that the feminine hygiene article is a sanitary napkin (10; 100), in particular an ultra-thin sanitary napkin.

20

41. An absorbent article according to claim 39, characterized in that the feminine hygiene article is a panty liner.

42. An absorbent article according to one of claims 38 to 41, characterized in that the liquid-permeable layer (18) comprises a central aperture.

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43. An absorbent article according to one of claims 1 to 38, characterized in that the absorbent article is a diaper.

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44. An absorbent article according to one of claims 1 to 38, characterized in that the absorbent article is an incontinence pad.

ABSTRACT

Described is an absorbent article comprising a liquid-permeable layer (18) disposed towards the wearer's body when the said article is in use; a liquid-impermeable layer (20) disposed away from the wearer's body when the said article is in use; as well as an absorbent body arranged between the liquid-permeable layer (18) and the liquid-impermeable layer (20). The absorbent body comprises an absorbent material (32) which remains able to flow even after contact with a liquid. In addition, the invention discloses an absorbent article which comprises a liquid-impermeable layer disposed away from the wearer's body when the article is in use, as well as an absorbent body covered by a liquid-permeable layer; with the said absorbent body containing an absorbent material which remains able to flow even after contact with a liquid. In this, the absorbent body is connected to the liquid-impermeable layer in a central area of the said absorbent body.

(Fig 2.)



Figure for publication with the Abstract

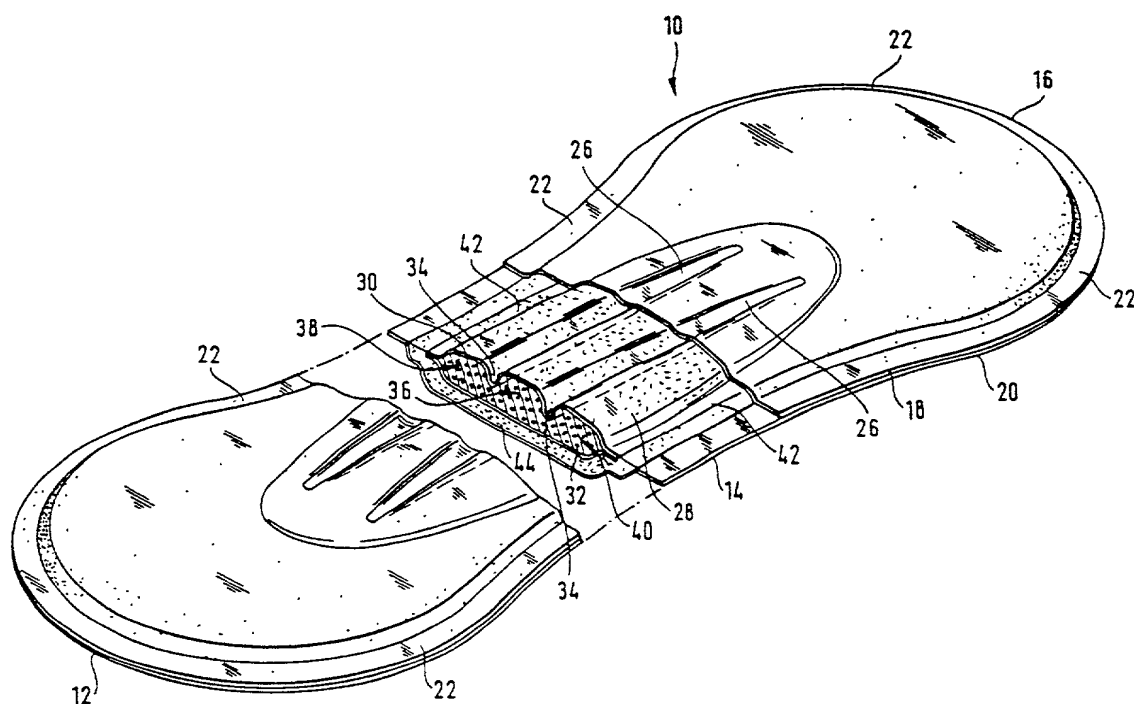


FIG. 1

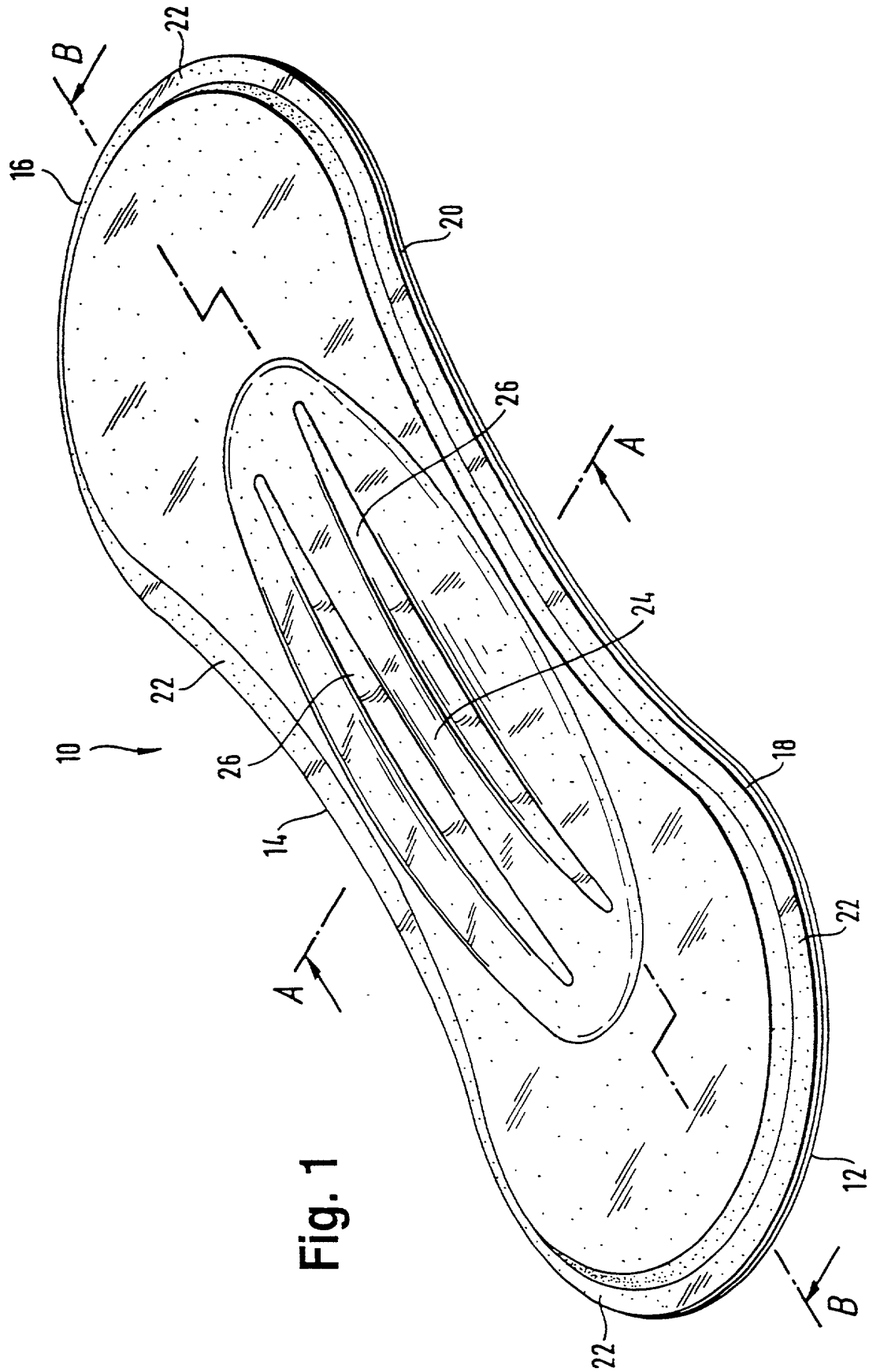


Fig. 1

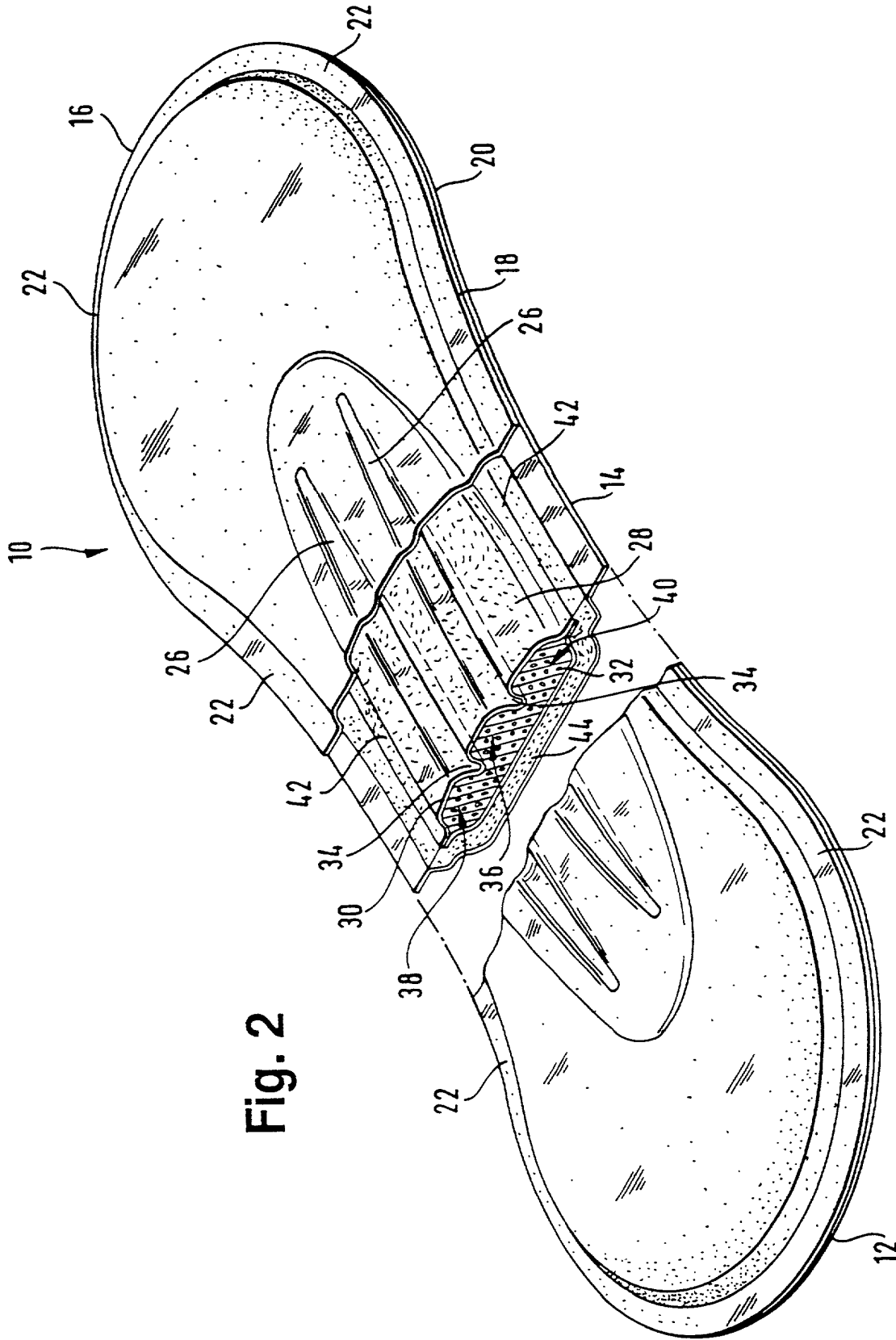
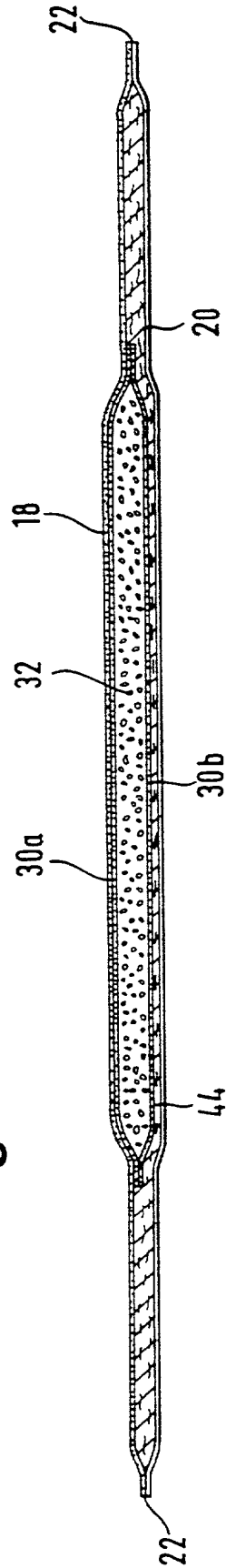


Fig. 2





**Fig. 5**

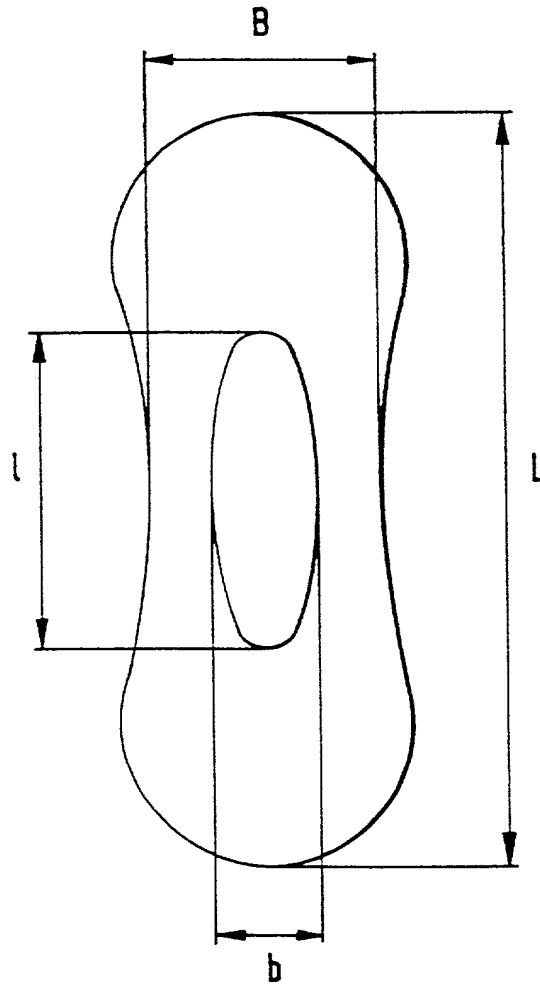


Fig. 6

Fig. 7

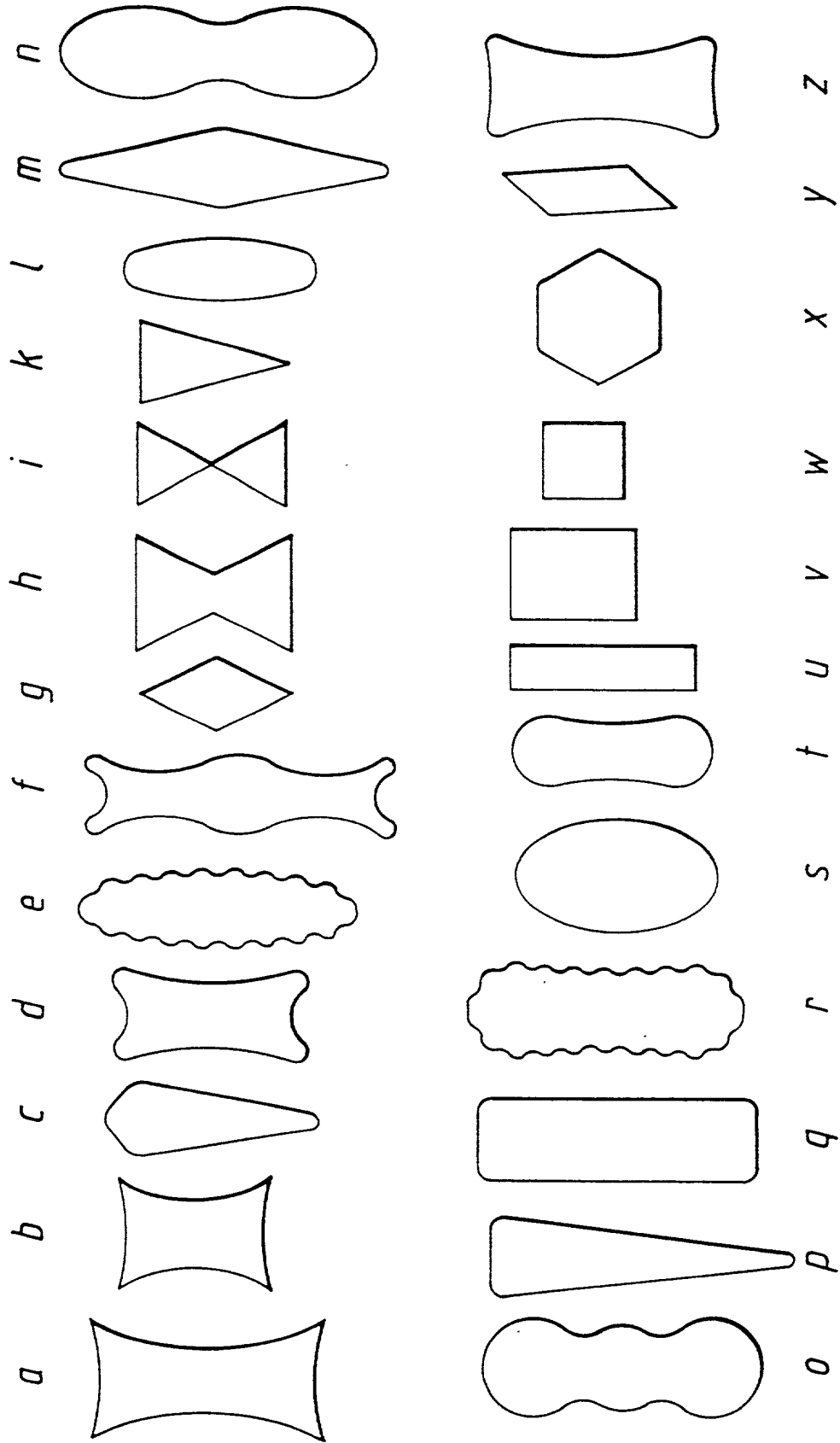
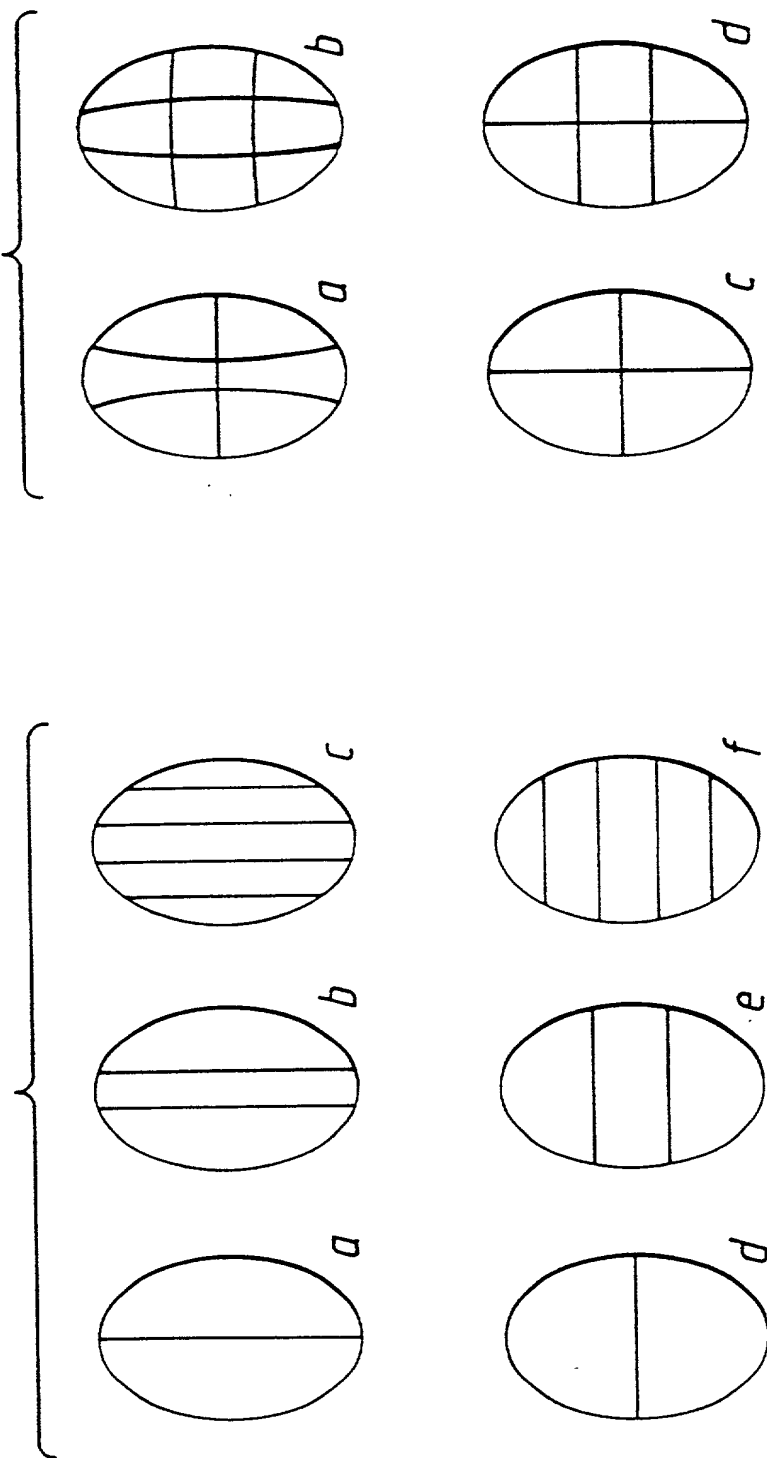
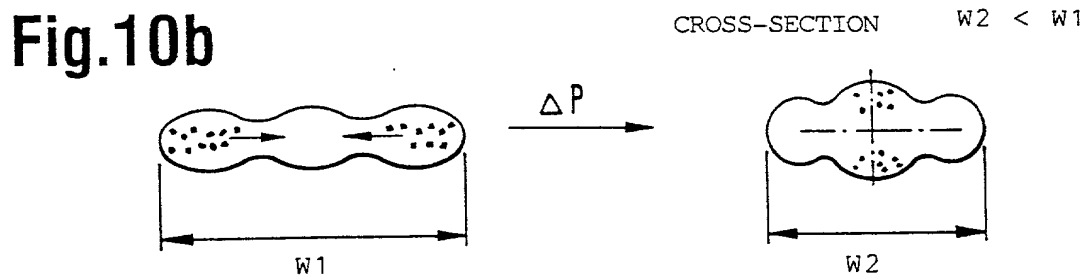
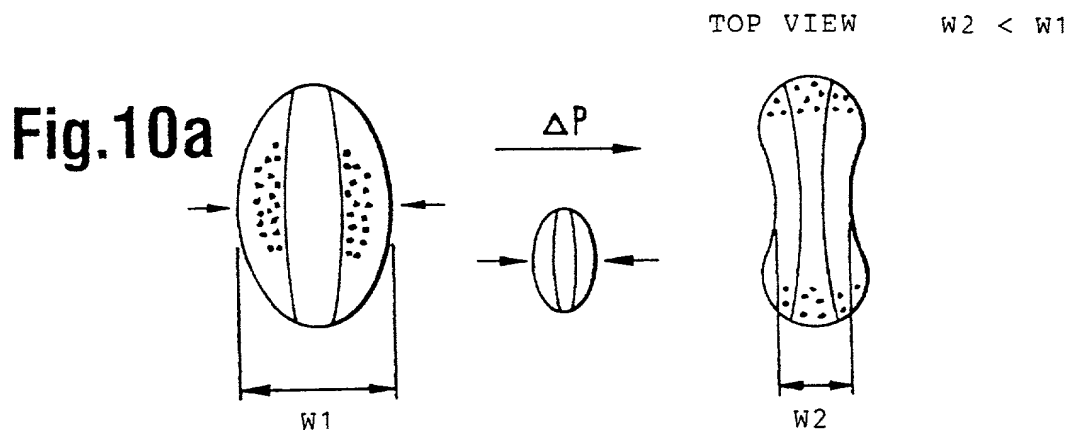


Fig.

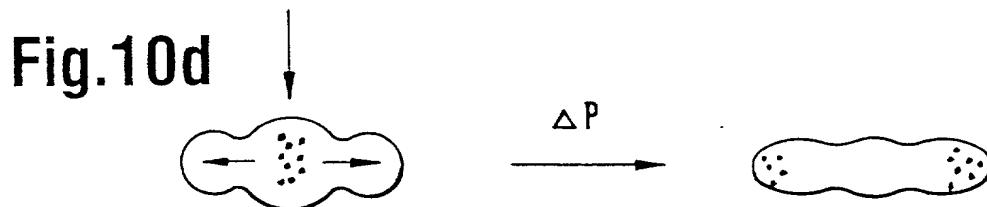
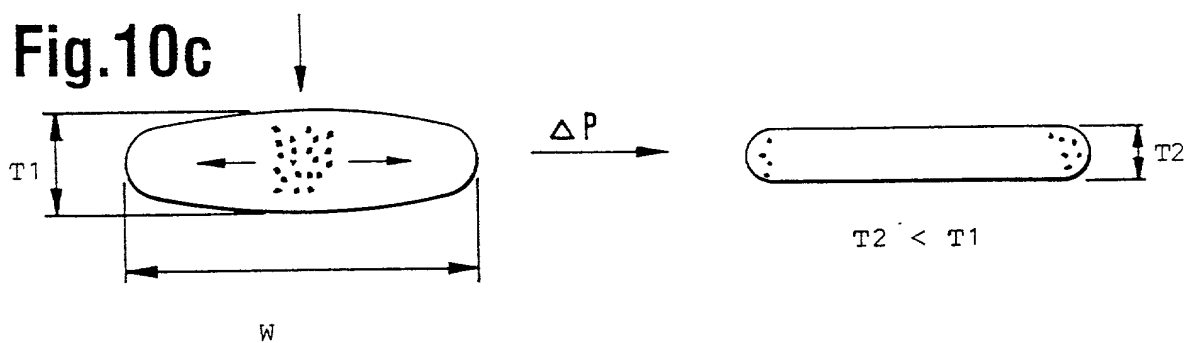


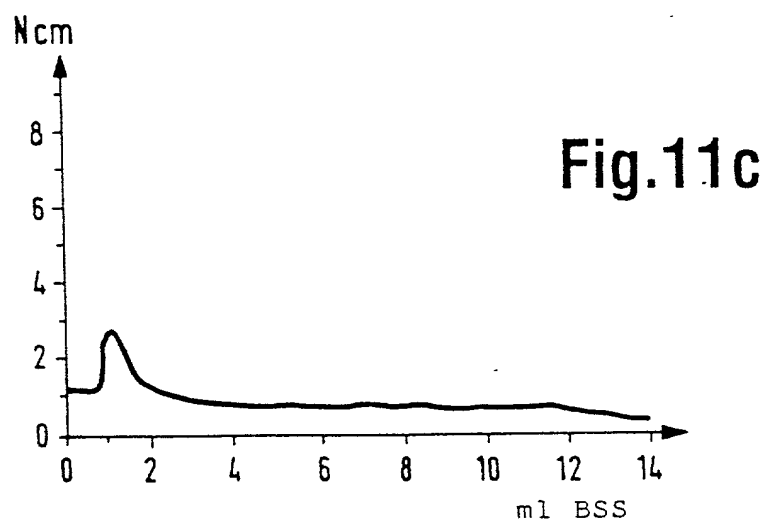
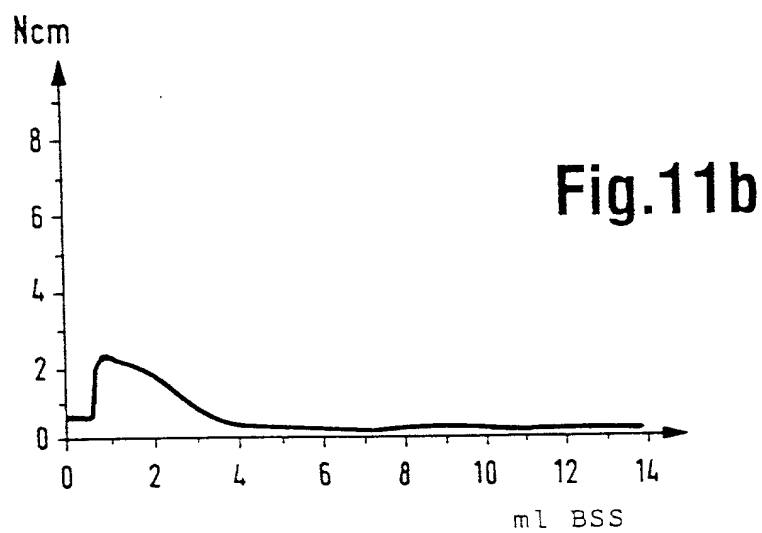
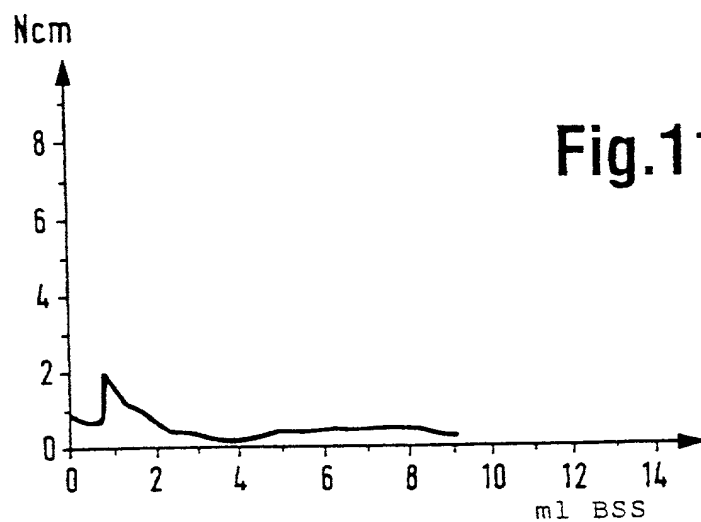


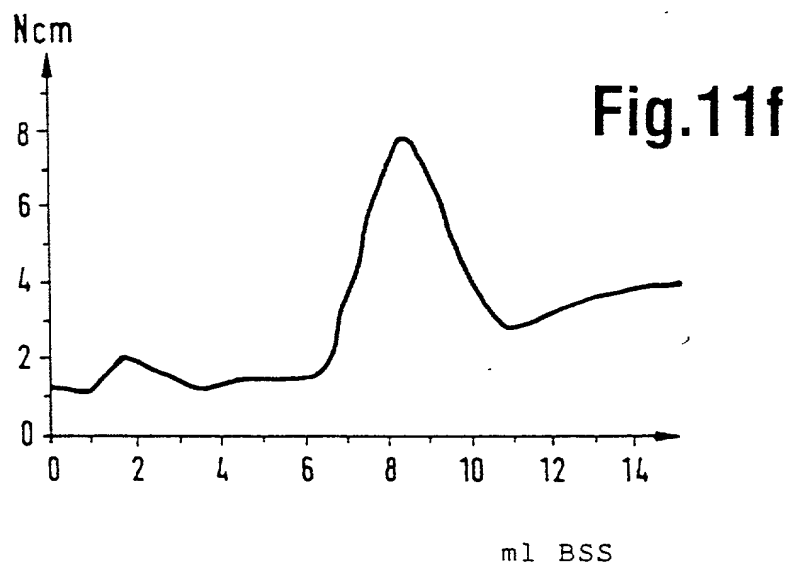
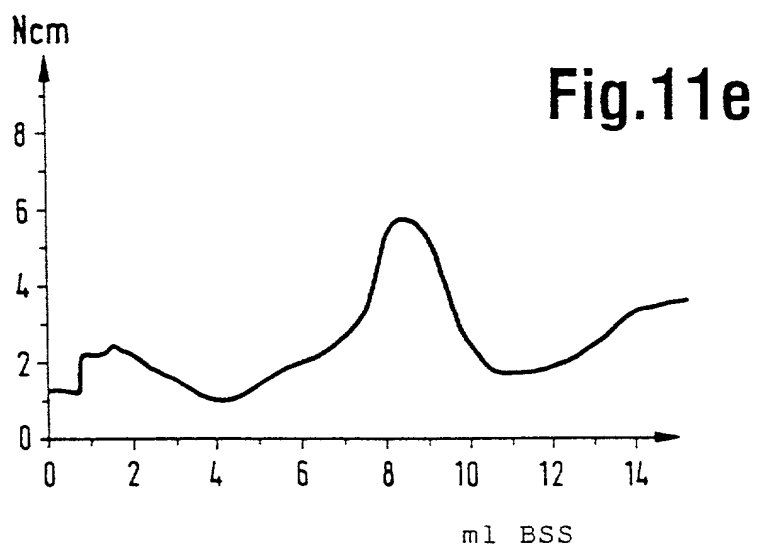
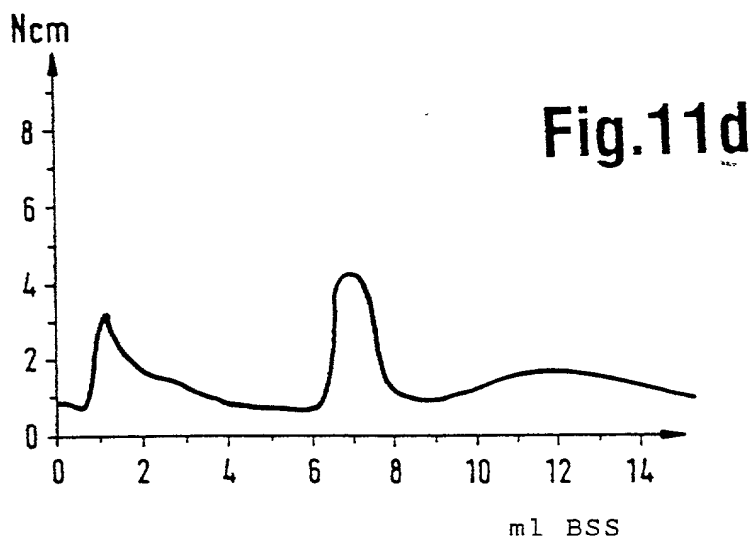
## DEFORMATION UNDER LATERAL PRESSURE LOAD



## DEFORMATION UNDER PRESSURE FROM ABOVE







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—●— 2. MAXIMUM AFTER COMPLIED HOMOGENISATION (APPROX. 6-10 ML BSS)

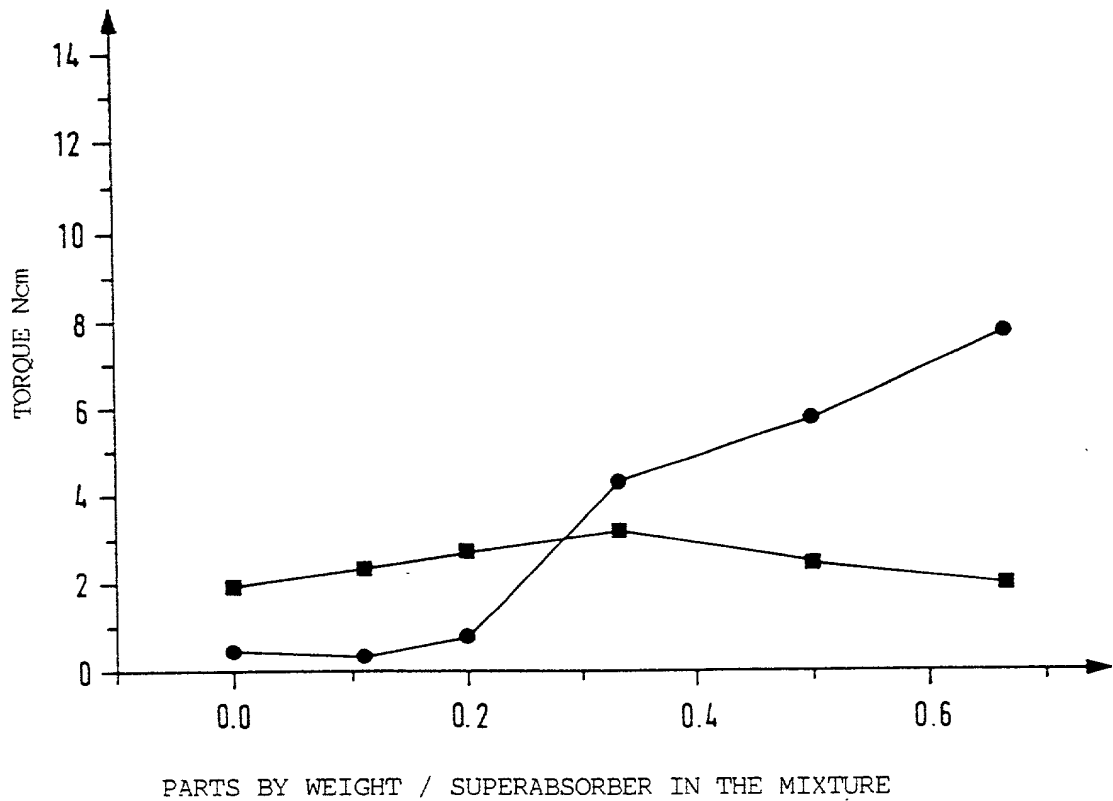
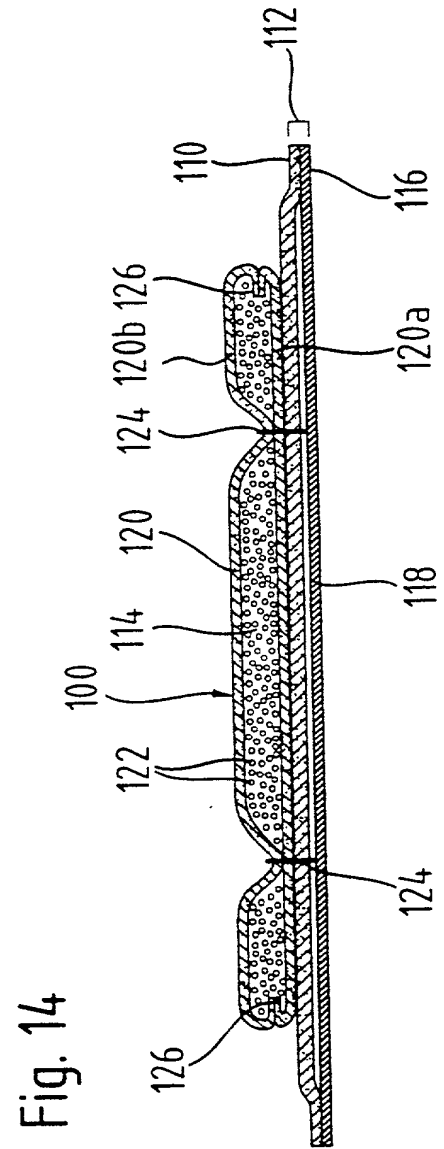
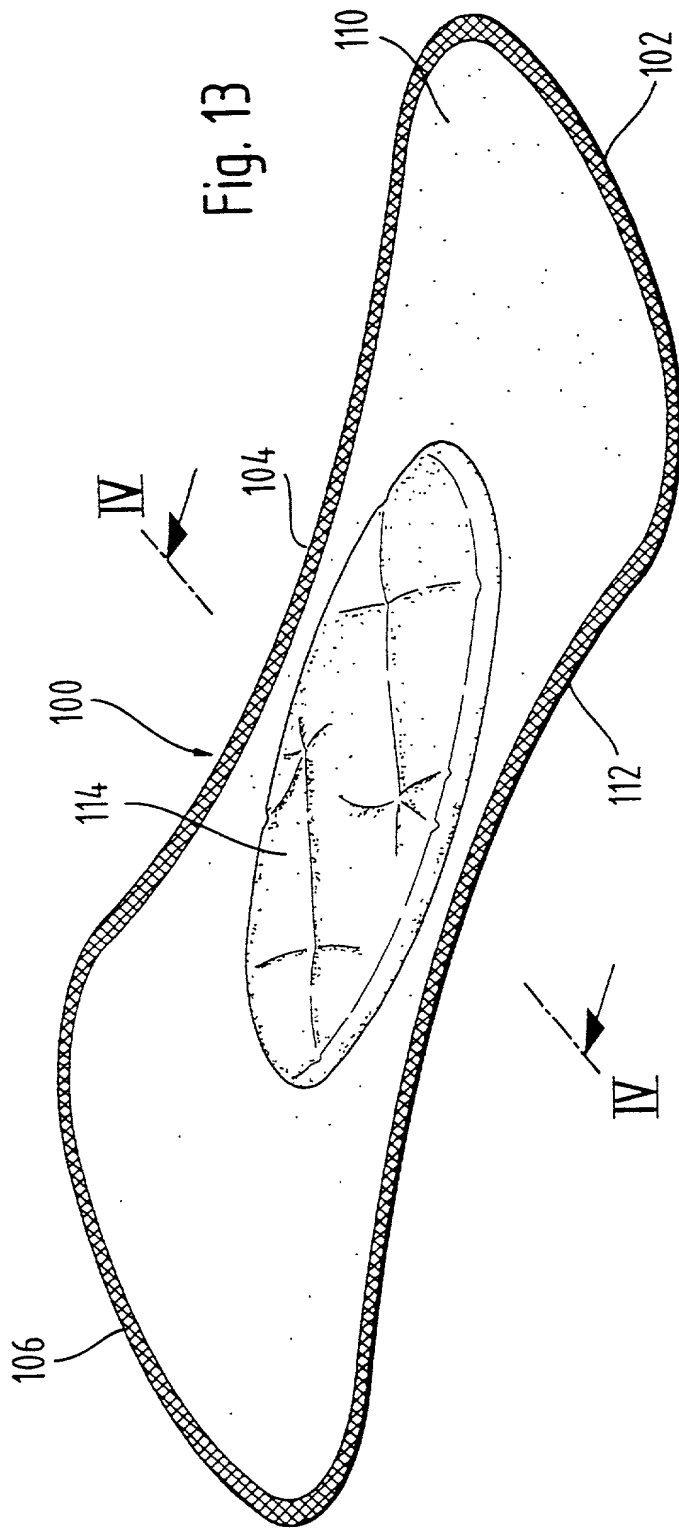
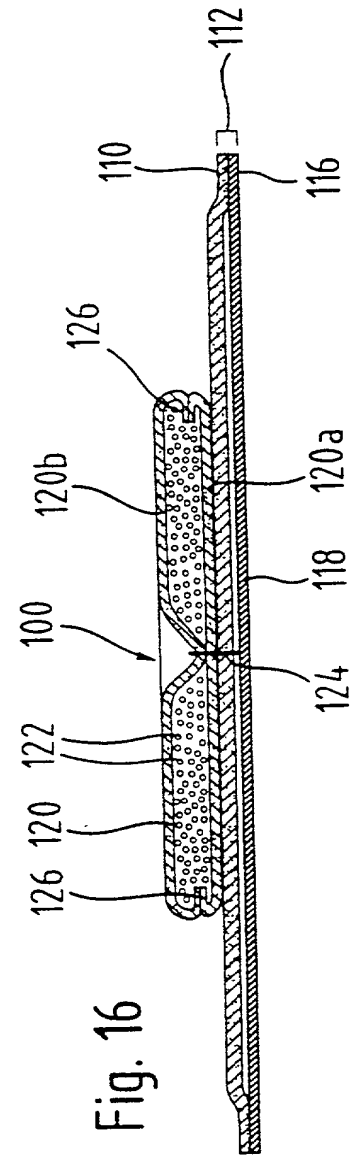
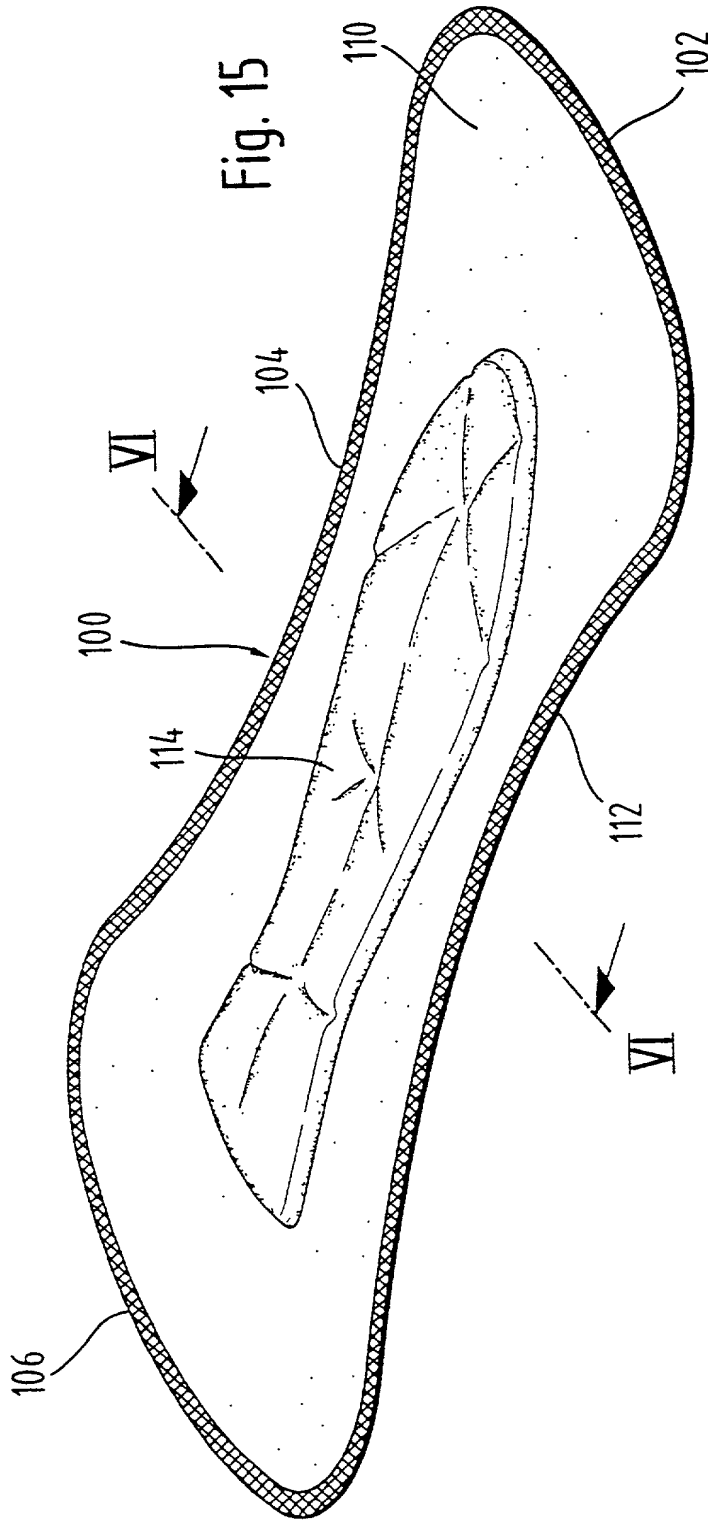
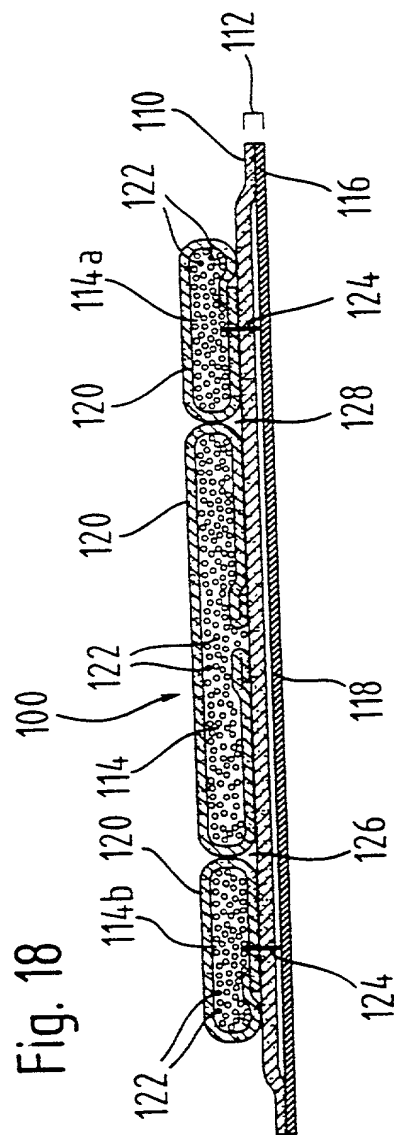
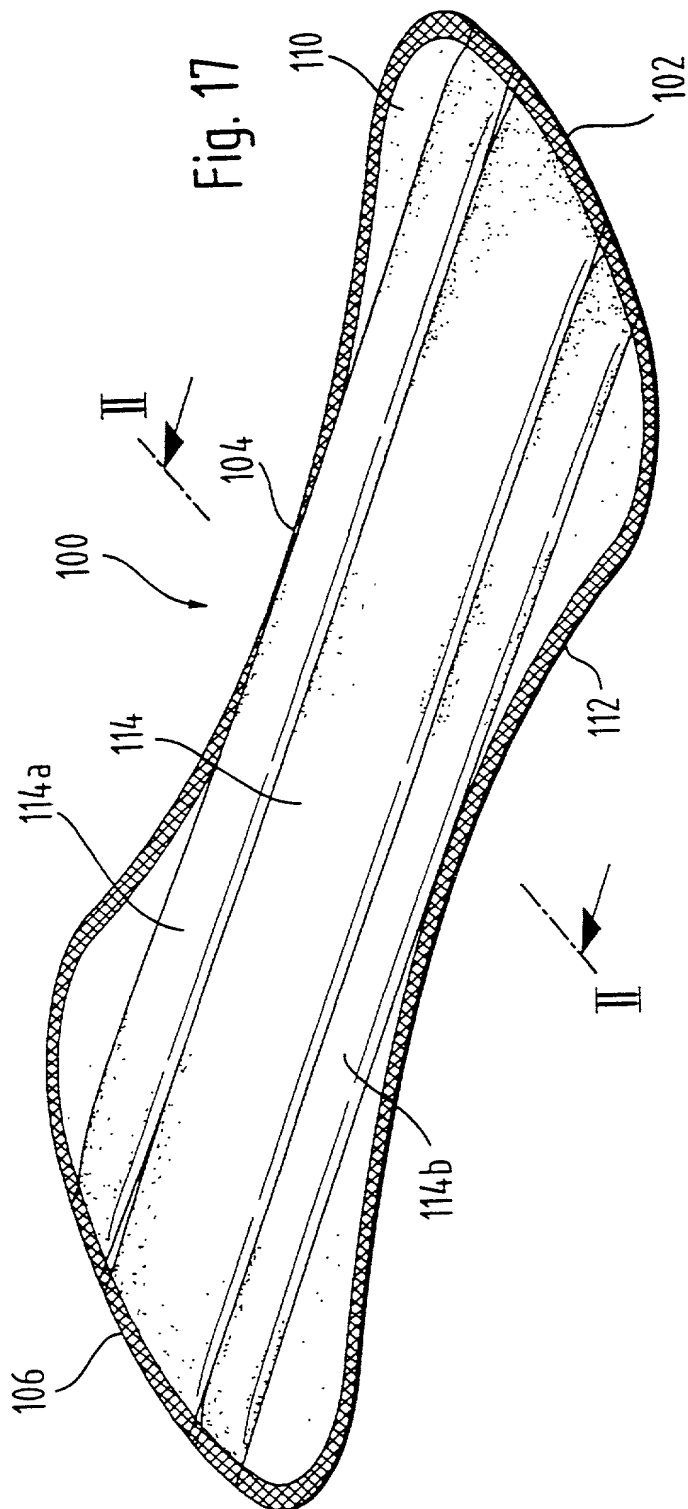


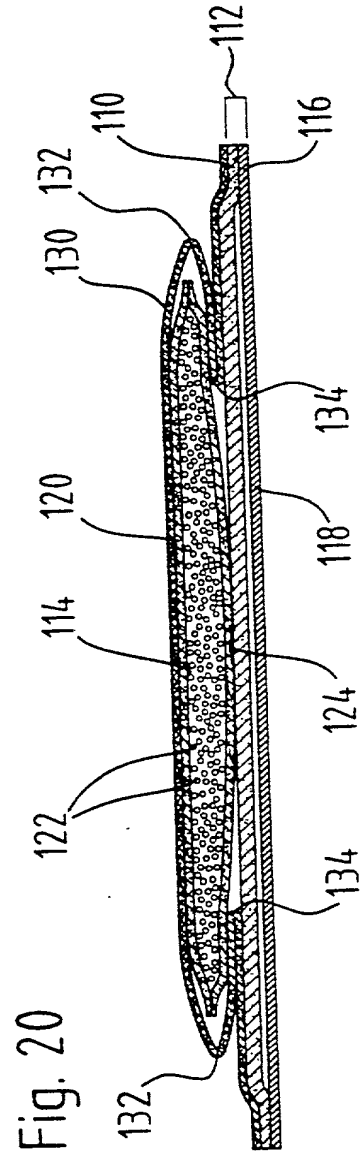
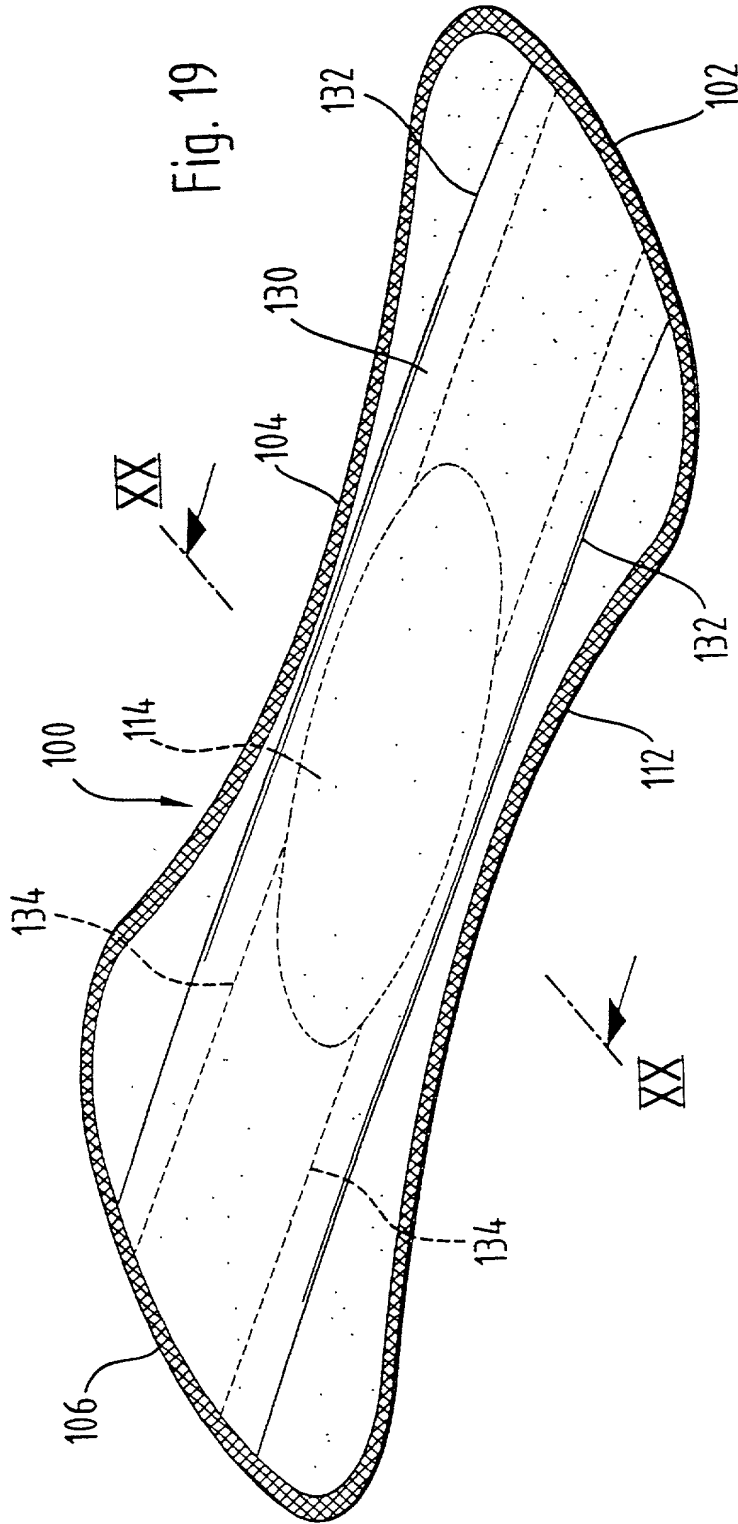
Fig. 12







attached to section





# Declaration and Power of Attorney For Patent Application

## Erklärung Für Patentanmeldungen Mit Vollmacht

### German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

#### ABSORBIERENDER ARTIKEL

deren Beschreibung

(zutreffendes ankreuzen)  
☐ hier beigefügt ist.

☒ am 27 September 1999 unter der  
Anmeldungsseriennummer 09/402,059

eingereicht wurde und am 27 September 1999  
abgeändert wurde (falls tatsächlich  
abgeändert).

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

#### ABSORBENT ARTICLE

the specification of which

(check one)  
☐ is attached hereto.

☒ was filed on 27 September 1999 as  
Application Serial No. 09/402,059

and was amended on 27 September 1999  
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

## German Language Declaration

Prior foreign applications  
Priorität beansprucht

Priority Claimed

<u>197 13 189 1</u> (Number) (Nummer)	<u>Germany</u> (Country) (Land)	<u>27 March 1997</u> (Day/Month/Year Filed) (Tag/Monat/Jahr eingereicht)	<input checked="" type="checkbox"/> Yes Ja	<input type="checkbox"/> No Nein
<u>197 13 190 5</u> (Number) (Nummer)	<u>Germany</u> (Country) (Land)	<u>27 March 1997</u> (Day/Month/Year Filed) (Tag/Monat/Jahr eingereicht)	<input checked="" type="checkbox"/> Yes Ja	<input type="checkbox"/> No Nein
<u>198 06 575 2</u> (Number) (Nummer)	<u>Germany</u> (Country) (Land)	<u>17 February 1998</u> (Day/Month/Year Filed) (Tag/Monat/Jahr eingereicht)	<input checked="" type="checkbox"/> Yes Ja	<input type="checkbox"/> No Nein
<u>PCT/EP98/01684</u> (Number) (Nummer)	<u>PCT</u> (Country) (Land)	<u>23 March 1998</u> (Day/Month/Year Filed) (Tag/Monat/Jahr eingereicht)	<input checked="" type="checkbox"/> Yes Ja	<input type="checkbox"/> No Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 112 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT Internationale Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

None	
<u>(Application Serial No.)</u> (Anmeldeseriennummer)	<u>(Filing Date)</u> (Anmeldedatum)
<u>(Application Serial No.)</u> (Anmeldeseriennummer)	<u>(Filing Date)</u> (Anmeldedatum)

None	
<u>(Status)</u> (patentiert, anhangig aufgegeben)	<u>(Status)</u> (patented, pending, abandoned)
<u>(Status)</u> (patentiert, anhangig aufgegeben)	<u>(Status)</u> (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissenschaftlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden können, und dass derartig wissenschaftlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

## German Language Declaration

VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwälte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschäfte vor dem Patent- und Warenzeichenamt: (Name und Registrationsnummer antühren)

32  
 Patricia A. Charlier Reg. No. 38,840  
 Thomas J. Connelly Reg. No. ~~28,404~~  
 Gregory E. Croft Reg. No. ~~27,542~~  
 Jeffrey B. Curtin Reg. No. ~~37,601~~  
 Jeremiah J. Duggan Reg. No. ~~24,470~~  
 Steven D. Flack Reg. No. ~~40,608~~  
 Thomas M. Gage Reg. No. ~~33,385~~  
 Joseph P. Harps Reg. No. ~~28,854~~  
 William D. Herrick Reg. No. ~~25,468~~  
 Kyle K. Kappes Reg. No. ~~34,864~~  
 John P. Kirby, Jr. Reg. No. ~~25,348~~  
 Nancy M. Klembus Reg. No. ~~40,051~~  
 Nicholas N. Leach Reg. No. ~~31,776~~  
 Thomas J. Mielke Reg. No. ~~31,399~~  
 Douglas L. Miller Reg. No. ~~30,406~~  
 Lisa J. Moyles Reg. No. ~~40,737~~  
 Thomas M. Parker Reg. No. ~~42,062~~  
 Brian C. Pauls Reg. No. ~~40,122~~  
 Sebastian C. Pugliese Reg. No. ~~42,091~~  
 James B. Robinson Reg. No. ~~34,912~~  
 Karl V. Sidor Reg. No. ~~32,597~~  
 Douglas H. Tulley Reg. No. ~~34,743~~  
 Patrick C. Wilson Reg. No. ~~31,893~~  
 Paul Y. Yee Reg. No. ~~29,460~~  
 Thomas W. Speckman Reg. No. ~~22,617~~  
 Douglas H. Pauley Reg. No. ~~33,295~~  
 Maxwell J. Petersen Reg. No. ~~32,772~~  
 Mark E. Fejer Reg. No. ~~34,817~~  
 Charles C. Kinne Reg. No. ~~31,631~~  
 Nick C. Kottis Reg. No. ~~31,974~~  
 Kevin D. Erickson Reg. No. ~~38,736~~  
 Roland W. Norris Reg. No. ~~32,799~~

Telefongesprache bitte richten an:  
 (Name und Telefonnummer)

Maxwell J. Petersen (847) 490-1400

Postanschrift:

**Pauley Petersen Kinne & Fejer**  
**2800 W. Higgins Road, Suite 365**  
**Hoffman Estates, IL 60195**

BEVOLLMACHTIGUNG DER ANWÄLTE, AUFTRAGE UND INSTRUKTIONEN VOM VERTRETER DES ANMELDERS ENTGEGENZUNEHMEN UND AUSZUFÜHREN

Der die Erklärung und Vollmacht Unterzeichnende ermächtigt die obengenannten Rechtsanwälte in den USA Weisungen vom Vertreter

Kimberly-Clark Worldwide, Inc.  
 401 North Lake Street  
 Neenah, Wisconsin 54956

or  
 Diehl Glaeser Hiltl & Partner  
 Fluggenstrasse 13  
 D-80639 München  
 Germany

bezüglich jedwelchen erforderlichen Tätigkeiten gegenüber dem Patent- und Warenzeichen-Amt der USA entgegenzunehmen und auszuführen, ohne dass die obengenannten amerikanischen Rechtsanwälte mit dem Unterzeichnenden direkt Kontakt aufnehmen müssen. Im Falle, dass die Vertreterin oder der Vertreter, von denen Instruktionen entgegengenommen werden dürfen, geändert werden soll, so werden die genannten amerikanischen Rechtsanwälte vom Unterzeichnenden unterrichtet.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following Attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

Patricia A. Charlier Reg. No. 38,840  
 Thomas J. Connelly Reg. No. 28,404  
 Gregory E. Croft Reg. No. 27,542  
 Jeffrey B. Curtin Reg. No. 37,601  
 Jeremiah J. Duggan Reg. No. 24,470  
 Steven D. Flack Reg. No. 40,608  
 Thomas M. Gage Reg. No. 33,385  
 Joseph P. Harps Reg. No. 28,854  
 William D. Herrick Reg. No. 25,468  
 Kyle K. Kappes Reg. No. 34,864  
 John P. Kirby, Jr. Reg. No. 25,348  
 Nancy M. Klembus Reg. No. 40,051  
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 Thomas J. Mielke Reg. No. 31,399  
 Douglas L. Miller Reg. No. 30,406  
 Lisa J. Moyles Reg. No. 40,737  
 Thomas M. Parker Reg. No. 42,062  
 Brian C. Pauls Reg. No. 40,122  
 Sebastian C. Pugliese Reg. No. 42,091  
 James B. Robinson Reg. No. 34,912  
 Karl V. Sidor Reg. No. 32,597  
 Douglas H. Tulley Reg. No. 34,743  
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 Nick C. Kottis Reg. No. 31,974  
 Kevin D. Erickson Reg. No. 38,736  
 Roland W. Norris Reg. No. 32,799

Direct Telephone Calls to: (name and telephone number)

Maxwell J. Petersen (847) 490-1400

Send Correspondence to:

**Pauley Petersen Kinne & Fejer**  
**2800 W. Higgins Road, Suite 365**  
**Hoffman Estates, IL 60195**

AUTHORIZATION OF ATTORNEYS TO ACCEPT AND FOLLOW INSTRUCTIONS FROM REPRESENTATIVE

The undersigned to this declaration and power of attorney hereby authorizes the U.S. attorneys named above to accept and follow instructions from

Kimberly-Clark Worldwide, Inc.  
 401 North Lake Street  
 Neenah, Wisconsin 54956

or  
 Diehl Glaeser Hiltl & Partner  
 Fluggenstrasse 13  
 D-80639 München  
 Germany

as to any actions to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys will be so notified by the undersigned.

## German Language Declaration

Voller Name des einzigen oder  
ursprünglichen Erfinders:

Maria RAIDEL

Unterschrift des Erfinders

Datum

Maria Raidel

15.12.99

Wohnsitz

Nürnberg, Germany

Staatsangehörigkeit

Germany

Postanschrift

Ilzstrasse 88

D-90451 Nürnberg, Germany

Full name of sole or first inventor:

Maria RAIDEL

Inventor's signature

Date

Maria Raidel

15.12.99

Residence

Nürnberg, Germany

Citizenship

Germany

Post Office Address

Ilzstrasse 88

D-90451 Nürnberg, Germany

Voller Name des zweiten Miterfinders  
(falls zutreffend):

Franz ASCHENBRENNER

Unterschrift des Erfinders

Datum

Franz Aschenbrenner

14/12/99

Wohnsitz

Kastl, Germany

Staatsangehörigkeit

Germany

Postanschrift

Georg-Reiser-Strasse 15

D-92280 Kastl, Germany

Full name of second joint inventor:

Franz ASCHENBRENNER

Inventor's signature

Date

Franz Aschenbrenner

14/12/99

Residence

Kastl, Germany

Citizenship

Germany

Post Office Address

Georg-Reiser-Strasse 15

D-92280 Kastl, Germany